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BUREAU OF HYGIENE AND TROPICAL DISEASES.

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MEDICAL ORGANIZATION AND DISEASES OF THAILAND

BEFORE THE JAPANESE INVASION

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Medical Organization.

The health organization of Thailand has been centralized since 1918 in the Public Health Department of the Ministry of the Interior, with a Director General at its head. There are two bodies, the Health and the Medical Councils. The Health Council is composed of representatives of the Public Health Department, the Army and Navy, the Siamese Red Cross, the International Division of the Rockefeller Foundation, the American Presbyterian Mission, and other bodies. Its function is advisory. The Medical Council controls the activities of medical men and institutions.

In Thailand the medical missions and the Siamese Red Cross institutions are very active and are supported by grants from the Government. The American Presbyterian mission has been established in the country for more than 100 years, and has created 11 general hospitals (for instance those at Chiengrai, Chiengmai, Prae and Nan) and two leper asylums. The Government, however, controls medical institutions apart from these, and has made plans for an extensive medical service throughout the country. Siam is to be divided into four health divisions, in the North, East, Centre and South, each of which is to have a central hospital of 200 beds, with laboratories and facilities for the training of subordinate staff. In the important provincial centres there are to be second grade hospitals of 100 beds, and in more remote districts smaller hospitals and dispensaries are to be instituted. These plans are for the future ; at present they are far from realization. In Bangkok there are two large modern hospitals, the King Chulalungkorn and the Siriraj, accommodating 600 patients. At these are the schools from which medical men graduate after a course lasting 5 years. There is a Pasteur Institute, and there are three laboratories : the Government laboratory of the Ministry of Commerce, the laboratory of the Medical

Officer of Bangkok, and the laboratory of the Siamese Red Cross. In the provinces there are a few small Government hospitals, and dispensaries exist in the smaller centres, for instance in Lampang and Nan.

In the whole country, for a population of 13,000,000, there are about 500 qualified medical men ; of these, all except about 40 received their medical education at the two institutions in Bangkok mentioned above. They are mainly employed by the civil services, the Army, and the Red Cross ; only 2 per cent. are in private practice. More than half of the qualified medical practitioners live in Bangkok ; it is therefore evident that for the rest of the country the medical services are inadequate.

There is an old tradition of Siamese medicine, of which practitioners still exist in considerable numbers, and the Government does not hesitate to take advantage of the services of the more reputable exponents of this ancient art, but there are charlatans in this as in other similar communities. Gradually, however, the trained dispensers and sanitary inspectors (of whom there were 170 in 1931) will replace these practitioners of traditional medicine. But in rural Siam modern medicine is little known and is expensive, so that there is little demand for it by the naturally suspicious people, and such demand as there is is somewhat ineffective. It is not doubted, however, that the value of western medicine will be appreciated in due course.

Local authorities of the communes and larger units are permitted to promote their own health work, but few can as yet afford to employ experts. Nevertheless good work is being done, and these subordinate commune officers, for instance, carry out vaccination against smallpox. There are 69 first grade health units, under the control of medical officers, and 206 second grade units under the control of medical assistants. There are also two mobile units. The Army cooperates in the training of medical assistants, and dressers trained during military service join the health organization on discharge and are encouraged to settle in the villages.

Hospital nurses are trained in the various Government and Mission hospitals, and health nurses are also trained, though on a smaller scale. Midwives are difficult. In rural areas they are ignorant and harmful. Training was once organized, but the result was to drive all those who qualified into the towns. An attempt is now being made to attach a nurse-midwife to each health centre.

Education was made compulsory in Siam more than 20 years ago, and the Public Health Department has taken advantage of this fact to introduce medical education into the schools, where the children are taught the elements of hygiene. The efforts do not, however, end there, and the department has carried out health campaigns, aimed at the instruction of adults, by means of booklets, lectures, exhibitions and demonstrations. One such, for instance, was held during a pilgrimage to Pra Pathom. The Government also attempts to improve the public health by extension of economic progress and rural reconstruction through the co-operative credit societies.

There have been two extensive rural health surveys, notably one made under the auspices of the Rockefeller Foundation. These have focussed attention on the diseases of importance in the country.

Certain diseases are notifiable—plague, cholera, smallpox, cerebro-spinal fever and (though it has not yet been reported anywhere in the far east) yellow fever. Other diseases may be made notifiable as conditions may demand.

Insect-borne Diseases.

Malaria.—As in other far eastern countries, malaria is responsible for more sickness in Thailand than any other single disease, but it is quite impossible to give even an approximate figure of the number of cases which occur. The accurate diagnosis of malaria depends upon careful and expert examination of the blood, which is a procedure impossible to any but highly trained microscopists, and as has been made clear in the previous section, the number of trained men is wholly inadequate to serve the needs of the general rural population. It has been estimated that there are about 35,000 deaths each year from malaria, but since most of the death returns are made by village headmen, they cannot be regarded as accurate.

In the Public Health department there is a section devoted to the control of malaria, and there have, in the past, been several surveys of the country, in which British workers have played a notable part. The disease is not evenly spread throughout Siam; it is intense in the north and the south, where the country is hilly and the streams are perennial; it is much less intense, though present, in certain areas in the centre and east, where the country is dry for several months of the year, and where the water is too muddy for the development of the vector mosquitoes.

In the central plain, in spite of the fact that there is a lengthy wet season from July to December, the average rainfall is only about 1,000 mm. in the year, and this is found to be insufficient to support extensive rice cultivation. To overcome this difficulty use is made of irrigation, an art which has been practised by the Siamese for centuries. The water for these irrigation works is drawn from the rivers which, towards the south, are influenced by tidal movements, and which are largely used as traffic waterways. These movements provide a constant flushing motion which destroys mosquito larvae. In addition, the slow movement of the river water along the flat plains brings down masses of silt which is maintained long in suspension and which is thought to be inimical to the breeding of those anopheline mosquitoes which are efficient carriers of malaria.

In Bangkok malaria is not common, though *Anopheles barbirostris* and *A. hyrcanus* are ubiquitous and *A. vagus*, *A. tesselatus* and *A. subpictus* var. *malayensis* are found. *A. barbirostris* and *A. vagus* breed in the blind ends of waterways. None of these mosquitoes, however, is here a potent vector. There is malaria in some of the villages outside Bangkok, and *A. aconitus* is found after the rains. It is known as a good vector in Malaya. *A. annularis*, a poor vector, is also found.

As the plain rises to the foothills to the north and east, the character of the rivers changes, and clear mountain streams, which form ideal breeding places for dangerous species of *Anopheles*, are found in abundance. Here, in the north, north-east and east, are found *A. fluviatilis*, *A. minimus*, *A. culicifacies*, and, more rarely, *A. maculatus*, all potent vectors of malaria. In addition *A. vagus*, *A. barbirostris* and *A. philippinensis* are present, but are not of much importance. In these parts, where the economic status of the population is low, malaria is intense, and spleen rates of 80 to 96 per cent. are recorded. Benign tertian, subtertian and, more rarely, quartan forms are found, and the grave sequel of subtertian malaria, blackwater fever, is not uncommon. In Korat in 1912 there was an outbreak of blackwater in a non-immune labour force introduced to build a railway.

It is a matter for speculation how far the poverty of the natives affects their reactions to malaria, but it is a common opinion elsewhere that improvement in nutrition materially offsets the ill effects of the disease.

In the long coastal zone of southern Thailand the intensity of malaria varies greatly. In the province of Nakon Sritamarat on the east coast, and on the Nakon plain, there is little, and the spleen rate is only 6·5, in spite of the fact that the brackish water breeder *A. sundaicus* (*A. ludlowi*) a known vector, is found, along with *A. fuliginosus*, *A. hyrcanus* and *A. vagus*, species of less importance. In the province of Patalung, on the other hand, malaria is intense, and is carried by *A. ludlowi* and by those species which breed in the hill streams, of which *A. fluviatilis* and *A. minimus* are the chief. The spleen rate here is 86·2. In the hills is also found *A. aconitus*, associated in Singora with a spleen rate of 16·6.

In places where malaria is intense there is usually a high infant mortality from this disease. Children who survive go through a long period of ill health, but gradually acquire immunity, so that in adult life they may, though continuously infected, show little sign of physical ailment. The Siamese Government is alive to the fact of this high infant mortality. It is fully realized that the most satisfactory method of reducing it would be the elimination of the dangerous species of mosquitoes, but in these rural areas this is not yet possible. In the meantime the Government has made available to the people large supplies of quinine, which is either sold below cost price or is given free, so that infants and others may be tided over the attacks which might otherwise prove fatal, and be enabled to develop their immunity.

Natives living in areas in which malaria is not so intense remain susceptible to attacks of the disease when infection is possible, and these attacks occur usually during or after the rains, when the mosquito population is increased. The natives of the central plain are in this position, and since there is considerable poverty there, and a tendency to migration has been noticed, such natives as move to more malarious areas will provide a problem in public health. They will form a non-immune population in a heavily infected area, and will be subject to long periods of recurring attacks; fatal infections may be expected.

Control of malaria in the hills can be effective only when supervision of the many necessary operations is close. This is at present not possible in the rural districts, so that the best that can yet be expected is that death may be averted by the administration of quinine, and immunity gradually acquired. For Europeans precautions should be taken, such as the use of carefully kept mosquito nets, mosquito-proofed houses, mosquito boots and prophylactic drugs, and mosquito breeding should be prevented within at least ½ mile of habitations. The control of breeding includes such measures as the training and periodical flushing of streams, the treatment with antilarval oils or Paris green, and the draining of pools of water, but for the details of these measures experts versed in the local conditions should be consulted.

Dengue is a fever which, though acute and painful, is in itself trivial in that the mortality is almost nil. It may, however, sweep over a district in epidemic fashion and cause extensive interference with normal life for a short period. An epidemic was reported in Bangkok in 1901 in which 70 per cent. of the population were attacked, but in which no deaths were recorded. One American writer states that it is

epidemic in Bangkok every year and plays havoc with the Europeans, though the natives do not seem to suffer so much from it. It is conveyed from man to man by the mosquito *Aëdes aegypti*, which is found extensively in the Far East, especially in coastal areas. This mosquito is also, in other parts of the world, the carrier of yellow fever, so that it may be certainly stated, that were yellow fever to be introduced into these countries, its spread by this mosquito would be inevitable. *Aëdes aegypti* breeds commonly in domestic collections of water, especially in water butts, jars and cisterns, and it is a general custom for the Siamese to keep water in such receptacles.

With the development of air travel it is possible that mosquitoes infected with yellow fever, or persons in the incubation (and infective) stage of the disease, may be transported from Africa to India and the Far East, to initiate epidemics in those countries, and for this reason the authorities should be vigilant in the supervision of aircraft and travellers. The measures in force in India and other countries are well known to health authorities; to be effective they require the whole-hearted support of the administrative services.

Dengue, therefore, may be taken as a pointer to the possible danger of yellow fever. It should be borne in mind in the diagnosis of fevers in Thailand.

Sandfly fever, another trivial disease, has been reported as not uncommon in Bangkok.

Plague is essentially a disease of rodents, particularly, in the Far East, of rats. It is closely associated with grain stores, in which rats find food and harbourage, and therefore with ports and ships, and it is largely carried along trade routes.

Plague was imported into Bangkok in 1904, probably from Bombay. Since then there have been cases in Bangkok every year, and in the 17 years 1905–1922 there were discovered 1,722 cases. These figures do not indicate a serious position and are not unlike those reported from Singapore and Saigon. Yet in Bangkok rat harbourages are plentiful, especially in the old buildings whose floors are slightly raised from the ground. The explanation of the relatively low incidence of plague under these circumstances may lie in the fact that the rat most commonly found in Bangkok is *Rattus norvegicus*, whose contact with man is never so close as that of *R. rattus*.

In other parts of the country plague has appeared in epidemic form, chiefly in the season from November to April, especially in the market towns and villages in which storehouses offer conditions suitable to rats, for instance at Phra Pathom in 1907. In Korat there was a devastating outbreak in 1917–18 during which 10 per cent. of the population died of the disease. Energetic measures, however, were taken, and since then there has been no major epidemic in that town. In spite of these recurring outbreaks in isolated places, which are overcrowded and insanitary, plague has not proved to be a major problem, and this again may be due to the species of rat most commonly found. It has been claimed that the rat trapping and poisoning campaigns and the education of the people in the construction of rat-proof buildings and in the proper disposal of refuse and the storage of food have helped to reduce the incidence, but these measures can hardly have been so completely undertaken throughout the country as to have made any decisive reduction in the rat population. They indicate, however, an understanding of the correct solution of the problem. No epidemic of pneumonic plague, a form transmitted from man to man

directly, has been reported; the majority of cases have been of the bubonic type. In 1937 it was stated that no cases of any kind had been reported since 1934, but there was a considerable outbreak in several parts of the country in 1938–40.

Typhus.—No record of diseases of the typhus group in Thailand has been seen, but since it is known that louse-borne and mite-borne typhus are found in Indo-China, and flea-borne and mite-borne in British Malaya, it would be surprising if Thailand were completely free. It is probable, however, that none of these varieties is a major problem there, but the possibility of their appearance should be borne in mind. Flea-borne typhus is contracted from rat fleas, and mite-borne typhus (tsutsugamushi disease) from the mites which abound in bush country or newly cleared areas; this disease may be a serious menace to troops operating in bush country. The louse-borne form may be associated with louse-borne relapsing fever (see below).

Leishmaniasis.—Reports of this affection are conflicting. One author states that he has seen in Bangkok a case of kala azar in a native who had never left the country, but a later writer failed to find it there in spite of search. The first worker also states that *Leishmania tropica* may be found in 2 per cent. of all ulcers seen in Bangkok.

Relapsing fever has been found in Bangkok, though very rarely. The vector is probably the louse.

Rat-bite fever, though not a disease carried by insects, may be referred to here, since the causative organism is of the same group as that of relapsing fever. Cases have been seen in Bangkok. Though not commonly found, this disease should be remembered as a possible diagnosis.

Nutrition.

It is stated that in Thailand foodstuffs are produced plentifully and are exported, but there is, nevertheless, poverty among the peasants of the north, and food deficiency diseases are by no means uncommon. The principal article of diet is rice, which is largely cultivated throughout the country, in the hills as well as in the great plain. The danger of a diet of rice lies in the fact that in the process of husking by mechanical means certain parts of the grain, which contain vitamin B_1, are removed. The result is that the grain left for food, known as polished rice, though easy to digest and pleasant to look at, is inadequate alone to maintain good health. Unfortunately this method of preparation is cheap and convenient, and the finished product has its attraction. It is also the custom of Europeans to use only polished rice, which has become, therefore, a mark of some distinction, to be used as much as possible by those natives who imitate the habits of the whites. Europeans, however, take so varied a diet that vitamin B_1 is consumed in sufficient quantity in the other articles of diet, but for many Siamese natives rice is not only the staple, but is also almost the only, food. Fortunately, in some of the districts where this is so, machine-milled rice is not in such common use and the hand-milled rice retains the vitamins, but there are parts of the country where the effects of the consumption of a diet mainly of polished rice are shown by the relatively high incidence of beriberi. This disease causes many deaths and much disablement; in Indo-China it stands high as a cause of ill health, and though the records in Thailand are not so complete as those of Indo-China, it is known to be common there also. In a recent report,

however, it is stated that the incidence of beriberi is not so great as it once was, because the use of polished rice is diminishing.

There are, of course, many additional foods in various parts of the country. Fish is largely eaten along the coast and in some rural districts. Salted fish is exported from coastal areas. Animals are not slaughtered by the country people except in unusual circumstances, but in Bangkok, where meat is eaten in large quantity, slaughter is carried out under good conditions in a well equipped abattoir. Pork is a food used by a proportion of the more wealthy natives, and chickens and eggs are sometimes eaten. Vegetables and fruits are available in many places; the coconut and the sugar cane are cultivated.

But in the main the natives are ignorant of food values. There is little production of milk, and the maintenance of cattle for food is not common. The lack of animal protein in the diet is a matter to be remedied by education and by an extensive campaign by the veterinary department.

Beriberi is not the only deficiency disease seen in Thailand, though it is the most important. There have been reports of pellagra and of a high incidence of stone in the urinary tract. McCarrison in India has put forward the view that the latter may be due to lack of vitâmin A.

Water Supplies, Sanitation and Housing.

As in most eastern countries, the water supplies of rural Thailand are open to continual gross contamination. In the country districts water for all purposes is taken from shallow wells, ill constructed and badly kept, and from streams, rivers and canals which are polluted by the household refuse of the inhabitants of their banks. It is stated, however, that in some places temporary wells are dug close to river banks so that there may be some protection of the water by the process of filtration through the soil. How far this protection can be effective depends upon the manner in which such wells are treated; if the sides are loose and if the natives walk into the water or dip into it their contaminated jars, as is usual in many countries, pollution is inevitable.

The proper construction of wells is a matter in which the Government takes an active interest, and grants are made for this purpose, while supervision is exercised by the sanitary authorities.

Rain water is largely used in rural areas, and is probably the safest supply. The difficulty is in storage, which is usually insufficient for the quantity required. Large jars are made for this purpose, but it should be remembered that *Aëdes aegypti*, the mosquito responsible for the spread in Thailand of dengue and in other countries of yellow fever, breeds in such domestic water collections.

In the dry seasons of past years cholera has appeared in the riparian populations, possibly conveyed in the river water, possibly in water from the overworked and badly kept wells along their banks. During these outbreaks the Government has adopted the measure of providing galvanized iron tanks in which water is stored after having been cleared with alum and chlorinated. These temporary expedients have, however, indicated the possibility of providing good supplies in populous districts by some such means.

In Bangkok the position is different. Here there is an excellent piped supply to the eastern part of the city, drawn from the river

Chao Phya 40 kilometres to the north, and cleared by coagulation, sedimented and filtered by modern plant. Fountains for public use are provided from this supply, but the natives in parts of the city still use the numerous *klongs*, or canals, for all purposes, though the water in these is so polluted that it may be regarded as dilute sewage. In western Bangkok rain water is stored in jars, which again form the breeding places of *Aëdes aegypti*.

As regards the quality of the water throughout the country, little information has been seen, but one medical writer notes that goitre is fairly common in some districts, and it is known that elsewhere in the world this condition is associated with lack of iodine in the water.

Bound up with the question of water supplies is that of sanitation and the disposal of excreta. In general, the Siamese take no care to dispose of excreta in a safe manner, and indiscriminate defaecation is the rule. Under the guidance of the sanitary authorities, however, proper latrines are being constructed, and a type of precast cesspit is becoming popular. It may be noted that animal dung is not much used as manure, though the agricultural department is urging its use. To explain to natives that human excreta are dangerous and that animal excreta are helpful needs a nice discrimination of reasoning to carry conviction.

Houses in Thailand are usually built so that the floor is raised from the ground on poles. The space beneath the floor, an obvious place for rubbish, provides ideal harbourage for rats, and the thatch in common use for roofing offers shelter for climbing rats. The use of corrugated iron, shingles and tiles, however, is increasing.

Intestinal Diseases.

Cholera is usually a water-borne disease, and its propagation therefore depends largely on the faulty protection of water supplies and the pollution of those supplies by human excreta. This may take place by the passage of faeces directly into the water, as may happen in rivers in which people bathe, or by defaecation in the immediate neighbourhood of wells, or by the washing of contaminated clothing in water used for drinking. Carriage of contamination by flies is also a method of spread. As a rule the organisms of cholera are excreted by persons in the active stage of the disease or in early convalescence only.

Cholera is usually present in central Thailand during the dry months of the year, but the outbreaks are generally small; it is only occasionally that epidemic conditions occur. Central Thailand is well watered by several large rivers and is intersected by numerous canals, and for the reasons given above the natives are liable to water-borne infections. Cases are found in the villages every year and the infection is presumably carried from season to season among the Siamese themselves, but there is a report that the most recent severe outbreak was introduced from Burma. This presumably refers to the epidemic which became evident in 1936. In Bangkok the incidence fell from 2,193 cases in 1926 to 1 in 1934, and rose to 580 in 1936 and 1,851 in 1937. The severity of the disease is indicated by a death rate of 51·64 per cent. of the cases in 1937. It is known that at this time the incidence was also heavy in the provinces of the central plain and along the east coast of southern Thailand, and that for the whole country in 1936 and 1937 almost 10,000 cases were reported. Since notification cannot be complete, it is beyond doubt that the actual incidence was greater.

Control of cholera is attempted in a number of ways: Firstly by education of the public in the care of drinking water and by the use of disinfecting chemicals during epidemics. Secondly by the provision of clean temporary supplies at suitable river centres during epidemics; boats are used to carry this water. Thirdly by the care of food and markets and the supervision of vendors. Fourthly by instruction as to the danger of flies and of the consumption of uncooked food, and finally by mass inoculation of the population with anti-cholera vaccine. This is a big programme, of which one ultimate aim is the provision of pure water supplies in rural areas, and its progress towards realization cannot be rapid. Controlled water supplies are expensive and must be constantly supervised by experts, and the value of protective inoculation is limited, partly because the protection afforded is relatively transient. But the efforts are being made and for the moment the long view must be taken.

Fevers of the typhoid group are reported from Bangkok, and are, no doubt, common enough in the rest of the country. The diseases are most prevalent from July to December, and the rainy season extends from May to October. It has been suggested by one writer that during the rains contaminated material is washed from the ground surface into the canals and that rain water is contaminated during the process of collection. Milk supplies are usually grossly contaminated, and carriage of infection by flies, which abound, is probable.

Nevertheless, it has been stated that these diseases are not seen in the natives so frequently as would be supposed, and that it is in the Europeans that the incidence is relatively most heavy. An explanation of this may be that the natives have acquired immunity through long contact with the causative organisms.

Dysentery is common. Both the amoebic and the bacillary forms are seen and it is said that the former is the more frequent. But it is doubtful if more than a fraction of the cases of bacillary dysentery are diagnosed, since it is so often a fatal infection, especially in children, and it is probable that the majority are not seen by qualified medical men. In spite of the reported frequency of amoebic dysentery, liver abscess, a well-known sequel, is comparatively rare. A similar low incidence of liver abscess is reported in Indo-China.

Other Diseases.

In Thailand *hookworm infection* is widespread, but it is stated that it is nowhere intense enough to be a serious menace. In 1917 a campaign was undertaken, by the Rockefeller Foundation in association with the Red Cross Society, for the control of the disease. This lasted for six years and the measures inaugurated were then taken over by the Public Health Department. These consist largely of the education of the people in the principles of sanitation and the construction of safe latrines, and it is now stated that the disease is under effective control, though in the remote districts the native sanitary habits are probably still primitive.

There are other intestinal worms which are common in Indo-China and no doubt also in Thailand, though records have not been seen. They are not of great importance.

Filariasis is common in Thailand.

In a recent report a number of infections with *Gnathostoma spinigerum* are recorded. This is not of much importance but should be remembered

as a possibility in diagnosis; it causes subcutaneous nodules to the size of a bean.

Leprosy is common. After a survey in 1937 it was stated that 16,893 cases were known, but in another report the incidence is estimated at between 20,000 and 50,000. The distribution appears to be fairly even throughout the country, though in the survey 7,041 were reported from the north-eastern area alone.

The American Presbyterian Mission has established two leper colonies, one in the north at Chiengmai and one in the south at Sridharmaraj, each colony receiving a Government grant. The Government has also established one centre at Bhuket in the south, one near the capital at Phra Pradaeng, and another institution in the east. These five centres have provision for 1,000 patients, but there are also, in the north and north-east, certain leper communities which have grown up, partly owing to administrative action and partly owing to local native custom. These, however, are rudimentary. It is thus evident that the majority of lepers are not under effective control, and to increase control efforts are made to provide units throughout the country, whose function it will be to give treatment in the native villages. Leprosy remains one of the major medical problems.

Yaws is very common, especially in children and young adults. It is especially so in the east and in some parts of the south of Thailand.

Venereal diseases are widespread. *Syphilis* is rampant, but, as in many other tropical countries, the late nervous complications are rarely seen. It may be taken as true that syphilis is a potent cause of infant deaths. *Gonorrhoea* is also common, and there is a report of the occurrence of *climatic bubo* (lymphogranuloma inguinale), though it is stated that in these cases there is sometimes no history of sexual contact.

Tuberculosis is estimated to account for more than 10,000 deaths each year, and the common pulmonary form is a very fatal affection of the Siamese. It is most common in urban centres, where overcrowding exists and close contact is inevitable, but is also found in rural areas. In the towns it is especially seen in the Chinese, who live under very crowded conditions.

There exists an anti-tuberculosis association which encourages public education, and at Bangkok there is a centre and hospital for free examination and treatment. Other centres are proposed for the provinces.

Tuberculosis is a major problem, and it is probable that the incidence is increasing.

Smallpox has broken out in Thailand from time to time in past years, as it has in all the far eastern countries, but of late there has been no serious epidemic. Figures for the whole country have not been seen, but in Bangkok the number of known cases in 1926 was 281, at the end of the great epidemic which spread over the whole of the far east—India, China, Japan and Thailand—in 1924–25. In 1927 there were 90 cases but from then to 1937 the annual numbers were below 10.

Vaccination was introduced by American missionaries in 1840–41 and a vaccine laboratory was established in Bangkok in 1903–04 and later transferred to Nagara Pathom. Vaccination against smallpox is now compulsory for the whole population and for immigrants, and it is stated that over 80 per cent. of the population have been vaccinated and that the proportion is increasing. Practitioners in the districts are

paid by results and the lymph is supplied free of charge, so that there is an incentive for them to encourage vaccination. The usual precautions against the introduction of the disease from overseas are taken at the ports.

Of the diseases which commonly occur in temperate climates *pneumonia* is a relatively common cause of death. It does not occur in epidemic form, but is constantly found. *Cerebrospinal meningitis* has been reported from prisons and barracks. *Diphtheria* is said to be increasing, and *measles* is common in Bangkok. *Mumps* is reported. *Influenza* has occurred in epidemic form, particularly during the world pandemic of 1918–19. Of the eye diseases *trachoma* is common. *Cataract* is also common.

Rabies is rare, but does occur. It is found in pariah dogs and transmitted to man by bite. There is a Pasteur institute at Bangkok at which treatment may be given.

Tetanus, though not often seen in adults, is a common affection of new-born infants and is contracted by them as a result of ignorance of the necessity for cleanliness in the treatment of the stump of the umbilical cord. It is here that the lack of competent midwives and physicians is evident. A few years ago there was an average of one case a day at the French hospital in Bangkok, and the cases were invariably fatal. Most of the infants were Chinese.

Other causes of infant mortality are diarrhoea, and wasting diseases for which the comprehensive native name *Sang* is used. It was estimated that in 1917 the infant mortality rate for Bangkok was over 300 per 1,000 per annum, and for this excessive rate blame was chiefly laid on the bad traditions of midwifery which obtained.

Drug addiction is not a problem in the rural population. The smoking of opium is mainly confined to the urban populations, especially the Chinese. The smoking of hemp is prohibited, and the Government has complete control over the import, manufacture, sale and use of drugs. It is therefore considered that no action other than education is needed to keep drug addiction within bounds.

Cancer is fairly commonly seen, especially of the mouth, and the view has been expressed that this arises largely from the native habit of betel chewing.

Lead poisoning has been reported in people coming to hospital in Bangkok from a part of the country where there are large deposits of lead and where the water contains a high proportion of the metal in solution. They show all the usual signs except the blue line on the gums, which cannot be seen on account of the discolouration caused by betel-chewing.

Snake bite is quite common. Mention is particularly made of the king cobra (*Naja hannah*) whose bite is particularly fatal, but the cobra *Naja naja* and the krait *Bungarus fasciatus* are doubtless found with the daboia, *Vipera russelli*, and others of the same family. The venoms of all these snakes are highly poisonous. In Bangkok there is an institution at which antitoxic serum for the treatment of snake bite is prepared.

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SUMMARY OF RECENT ABSTRACTS.*

VIII. TYPHUS GROUP OF FEVERS.

General.

FELIX (p. 230) provisionally classes the fevers of the typhus group according to the response to the Weil-Felix reaction, *viz.*, Type *Proteus OX19*; Type *Proteus OXK*; Type undetermined. These correspond with the following vectors: lice, and rat fleas; mites; ticks and [exceptionally in South Africa] lice and rat fleas. The various local names are also given. The serological classification of the third group awaits further investigation. The antigenic structure of the rickettsiae other than *R. prowazeki* had not been studied at the time Felix wrote, but the discovery of the yolk-sac and animal-lung methods of cultivation will probably lead to advances in knowledge of this kind. In comment MEGAW refers to the value of a classification by vector, from the clinical and epidemiological points of view, though for the causal organisms a classification based on antigenic type will undoubtedly be adopted.

PINKERTON (p. 25), in a critical analysis of the literature on the pathogenic rickettsiae, suggests that, because of certain morphological and other characters, those of the tick-borne group should be classed in the separate genus *Dermacentroxenus*. In comment MEGAW disputes the wisdom of this suggestion in view of the great similarity between the clinical and pathological effects produced by all these organisms. The organism of boutonneuse fever is differentiated by Pinkerton from that of Rocky Mountain fever because of certain immunological differences, but is probably the same as that of African tick-bite fever; the name *D. rickettsi* var. *conori* has been suggested. The organism of murine typhus is regarded as a variant (*mooseri*) of *Rickettsia prowazeki*. PHILIP (p. 828) discusses the nomenclature of the pathogenic rickettsiae, and proposes to retain the generic name *Dermacentroxenus*

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1943, v. 40. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

and to create a new genus (*Coxiella*) for the organism of Q fever. In comment MEGAW argues in favour of the retention of the generic name *Rickettsia* throughout.

CASTAÑEDA (p. 127), from his experience in Mexico, thinks that there are types of rickettsiae which vary in a whole range between the classical and murine types, and that there is no essential difference between these types. The striking differences observed in the animal reactions can be explained on the hypothesis that murine strains become modified after a number of passages through man. He reports that, from horses infected with a murine strain, a serum has been prepared which is about 16 times as potent as human convalescent serum; the murine strain also lends itself more readily than the human to the preparation of vaccines. He classifies fevers of the typhus group into four sections which are, essentially: (1) Those transmitted by ticks (except Q fever); (2) Those transmitted by lice and fleas; (3) The mite-borne group; (4) Q fever, and he holds that the immunological relationships between these are much closer than is usually recognized, giving examples in support of his views.

GEAR (p. 591) discusses the typhus fevers of South Africa and gives a table of fevers of this group, in which the diseases are differentiated according to vector. The head louse is regarded as an effective vector of epidemic typhus. BURNET (p. 234) gives an account of the rickettsial diseases of Australia; louse-borne typhus does not occur, murine typhus is rare, tsutsugamushi disease is found in northern Queensland, and Q fever has recently attracted considerable attention.

PLOTZ *et al.* (p. 685) describe the morphological appearances of the rickettsiae of "epidemic typhus," "endemic typhus," Rocky Mountain fever and Q fever, as revealed by the electron microscope. In spite of great variations in all four types, the basic structure is the same in all. SIKORA (p. 763) has made a morphological study of rickettsiae by intensive staining and ordinary microscopy at a magnification of 3,000 diameters. In comment, MEGAW criticizes the claims for accuracy at such magnifications.

GIROUD and PANTHIER (p. 764) claim that different structural phases of rickettsiae represent the result of different types of reaction of the hos tto the invading parasite. Bacilliform rickettsiae are the actively reproducing and highly pathogenic forms; granular clumps are found when the host is putting up resistance, but these forms may give rise to bacilliform types on passage through animals.

POMALES-LEBRÓN and MORALES-OTERO (p. 528) have compared 72 strains of *Proteus X* organisms in the United States; all except 5 were typical in biological and agglutination reactions. Agglutination tests were carried out with *Proteus OXK*, *X2*, *OX19* and *X19* on 1,000 persons; the results showed that *Proteus X19* is not suitable in testing for typhus, but that with *Proteus OX19* from the National Institute of Health a positive Weil-Felix reaction at 1 in 400 is significant. A considerable number of normal people agglutinated *OXK* in low dilution, and *OX2* even at 1 in 100.

STEUER (p. 898) describes methods of drying *Proteus* and other organisms for use in agglutination tests. The dried organisms may be kept as powders or impregnated into filter paper, and are satisfactory for the tests. Details are given.

SONNENSCHEIN (p. 529) has found strains of *Proteus* in a large number of wound secretions; these were largely H strains. The sera from some of the patients gave positive reactions with *Proteus X19*,

and in three cases tested, rickettsial agglutination was positive. In septic infections, therefore, the Weil-Felix is considered unreliable as an indication of typhus, unless positive at a dilution of 1 in 2,000; rickettsial agglutination does not help as it is positive in *Proteus* infections as well as in typhus.

Proteus OX19 type. Vectors: louse and flea.

Epidemiology.

Louse-borne.—MEGAW (p. 27) has written an account of louse-borne typhus, with special emphasis on the clinical features and methods of diagnosis. The original paper includes a short note on the other rickettsial diseases.

In a comprehensive account of typhus BIRAUD (p. 378) indicates the geographical distribution in Europe and the Mediterranean countries, and refers to the possibility of epidemic spread during and after the war. He discusses the various vaccines which have been prepared, and emphasizes the fact that killed vaccines are safe and do not provoke the incidents which were encountered when the live vaccine of BLANC and LAIGRET was used in North Africa. But although CIUCA has given good reports of the rodent-lung vaccines, conclusive evidence of the value of these and of the Cox vaccine in the field are not yet available. In comment, MEGAW remarks that vaccination should be regarded as a subsidiary method of control.

ZIMMERMANN (p. 27) gives an account of typhus in Poland in 1940. The epidemic, which was especially intense among Jews, began in many widely separated places early in 1940, and it is suggested that the probable reservoir of infection was clothing infected with dried louse faeces, in which it is known that the organism can survive for many months. Spread probably took place by the Jews who were driven from place to place, and was facilitated by the overcrowding to which these unfortunate people were subjected. In 1940 about 7,900 cases were recorded, but there must have been many more; as usual, case mortality varied with age, reaching 30 per cent. or more in persons over 35. PRIMITIVO DE LA QUINTANA (p. 126) gives an account of typhus in Spain, including the epidemic of 1939–41. Control was hampered by the prevailing state of malnutrition, movement of the people, and depletion of medical facilities; various vaccines were used, but true evaluation was not possible.

REMOND (p. 443) gives his opinion that in Algeria, where the distribution of typhus is not even, the areas of endemicity are those in which crops are liable to fail in seasons of drought and where the diet is generally deficient in proteins, fats and vitamins, whereas in areas in which outbreaks are only occasional, and are due to imported cases, the nutritional status of the people is good.

Louse-borne typhus is endemic in Asmara (Eritrea), and CIMMINO (p. 892) gives an account of its epidemiology there.

MACCHIAVELLO and CIFUENTES (p. 593) note that louse-borne typhus is common in Chile and that flea-borne typhus occurs; they do not believe that the latter constitutes a reservoir of infection of the louse-borne disease.

Flea-borne.—ESKEY (p. 834) shows that in 10 years about 20,000 cases of murine typhus have been reported in the United States, and that many more have probably not been recognized. Most cases can

be traced to domestic rats, and he discusses the various measures of rat control. TOPPING and DYER (p. 690) note that although endemic typhus [of murine origin] is still, in the main, confined to the south and south-eastern States of the United States, it appears to be spreading, and increasing numbers of cases are being reported from rural areas. *Xenopsylla cheopis* has been found in Iowa and other mid-western States.

ALICATA and BREAKS (p. 767) report on typhus (of murine origin) in Honolulu, where 202 cases were found in 5 years in one district alone. One strain of rickettsia from man was immunologically identical with strains from local rats and with the Wilmington strain. Strains were isolated from the brains of local rats.

MENDOZA (p. 767) reports flea-borne typhus from San Salvador, but states that head lice from one patient contained rickettsiae and caused death (in one case with scrotal reaction) in three rats, after being ground up and injected. EDMUNDO VÁSQUEZ (p. 767) refers to similar cases from this area; in some the Weil-Felix reaction was negative, but in his opinion the disease is murine typhus, though more laboratory investigation is necessary before a true assessment is possible.

FLOCH (p. 768) reports a case of flea-borne, or possibly tick-borne, typhus in Cayenne.

SORDELLI *et al.* (p. 385) have inoculated guineapigs and rats with blood from a series of typhus patients in Argentina. The results did not give a picture characteristic of that given by murine strains, although the authors do not deny a murine origin. In comment MEGAW suggests that an epidemiological investigation might yield interesting results. CARRETERO (p. 36) describes a mild outbreak of typhus, apparently of murine type, in Valparaiso.

From the Gold Coast FINDLAY *et al.* (p. 593) describe a case of typhus from which rickettsiae were passaged in guineapigs; a scrotal reaction was given only at the third passage. Similar rickettsiae were isolated from local *Rattus rattus* and *Cricetomys gambianus*, and specimens of *Xenopsylla cheopis* from giant rats gave febrile reactions after being triturated and injected into guineapigs. The black rat strain gave cross immunity with both the human and giant rat strains. The source of infection was probably the black rat, and the vector probably *X. cheopis*. SMITH and EVANS (p. 384) describe four cases of typhus in British soldiers in a West African colony in which the disease has not hitherto been found; they name it murine typhus, but do not indicate any epidemiological or laboratory investigations to support their contention that it was of murine origin. *Proteus OX19* was agglutinated in higher titre than *OX2* or *OXK*.

CECCALDI (p. 833) discusses fevers of the typhus group in Brazzaville, concluding that murine typhus is endemic and that inapparent attacks may occur. In comment, MEGAW states that the fevers of this group in West Africa are still something of an enigma. MOUSTARDIER (p. 594) describes a probable case of murine typhus in Brazzaville.

Aetiology.

FELIX (p. 230) explains that *R. prowazeki* has a heat-stable antigen which corresponds to the *O* antigen of *Proteus X19*; it has also a heat-labile antigen which gives rise to protective opsonins. The latter is probably similar to the *Vi* antigen of *Bact. typhosum*, which alone effectively immunizes animals against the virulent *Vi*+*O* bacilli.

The heat-labile antigen is not merely toxic, but also has the property of inhibiting the interaction between the *O* antigen and the *O* antibodies, thus protecting *R. prowazeki* against the opsonizing and bactericidal action of the natural and immune *O* antibody. The author goes on to say that there is no convincing evidence that convalescent human sera or animal sera have curative value, probably because antibodies to both the heat-labile and heat-stable antigens are not present. He suggests that the difficulty may be overcome by immunizing animals with the alkali-stable *O* antigen of *Proteus OX19*, which is believed to be common to that organism and *R. prowazeki*. This is now being attempted in horses, and in some animals very high titres to the Weil-Felix reaction have been attained. We do not yet know the best means of maintaining the labile antigen in vaccines, and it is possible that phenol and formalin may damage this as they damage the *Vi* antigen of *Bact. typhosum*. The Weil-Felix responses of volunteers vaccinated with various vaccines have been investigated, and have shown wide differences. Serum neutralization tests are contemplated, and it is possible that opsonin estimations will be used to measure the response to the labile rickettsial antigen, since Castañeda thinks that the *O* antibody plays no part in the opsonization of *R. prowazeki*.

In a series of cases of epidemic and murine typhus, VAN ROOYEN and BEARCROFT (p. 895) found that both responded to *Proteus OX19* at much higher titre than to *OX2* or *OXK*, and that with the rickettsial agglutination test the epidemic cases agglutinated the epidemic rickettsiae in far higher titre than the murine, and *vice versa*. It appears that the rickettsia agglutination test will differentiate the two diseases in a fairly clear-cut manner.

By the use of a new complement fixation technique, details of which will be published later, PLOTZ (p. 443) has been able to differentiate epidemic from endemic (murine) typhus. Cross fixation occurred in a minority of cases, but only at much lower titres than with the homologous serum. Investigations in Brill's disease support the view of ZINSSER that this is a form of epidemic typhus, and not of murine origin. The observations indicate that man serves as a reservoir of epidemic typhus between outbreaks, as does the rat in endemic typhus, and that Brill's disease is not spread by lice simply because lice are not present. By applying the new test, endemic typhus has been discovered in Jamaica and epidemic typhus in a South American country.

REYNOLDS and POLLARD (p. 897) state that an epidemic typhus vaccine of the Cox type is an effective antigen for use in the complement fixation reaction, which differentiates well the various rickettsial diseases. Positive results were given with a known specific typhus antiserum, and with the serum from one of two typhus patients (the negative result was with a serum taken as early as the 5th day), but not with antisera from Rocky Mountain fever and other diseases. Negative reactions were given by sera from persons who had been vaccinated against typhus, and false positives, therefore, do not occur in such persons. [No large series of sera from typhus patients has been investigated.]

Transmission: Louse control.

LÖFFLER and MOOSER (p. 28) in a paper on the transmission of typhus make several important points. Rickettsiae are present in the faeces of infected lice, but not in their salivary glands; they may

enter the body through scratches on the skin, by means of contamination of the biting apparatus of the louse, through the conjunctiva, or by inhalation. Lice do not become infected by biting persons with "inapparent" attacks. Infected louse faeces constitute the reservoir in inter-epidemic periods. Infected head lice have frequently been found, thus disposing of the view that they play no part in transmission; when the head of a louse-infested convalescent is shaken there must be great opportunity for scattering infected dust. Cases are quoted in which infection by the inhalation of infected particles, by laboratory workers engaged on the intranasal inoculation of mice, could be the only explanation of illness. Such workers, and others engaged in typhus research, are particularly liable to infection; vaccination is at least useful in modifying the severity of the disease, but other forms of protection, such as louse-proof clothing and gas masks, are essential.

Loos (p. 532) notes that typhus rickettsiae may be maintained alive in animal tissues for 6 months or more if kept sterile at 18°C.

In the *Army Medical Department Bulletin* (p. 900) it is shown that even 48 hours' intimate contact of infective lice with "Lethane 384 special" failed to kill the rickettsiae. Reference is also made to the great infectivity of dried infected louse faeces, and the danger to man of inhalation of such material. Donald and Barker (p. 30) give an account of the clinical features of typhus in a prison camp in Germany. It is noted that 16 of the 21 patients were employed in handling clothing at the camp disinfector.

As a result of attempts to infect guineapigs with the blood of convalescents from typhus, Potapchick (p. 893) concludes that such convalescents do not play an important rôle in the epidemiology of the disease.

Rose (p. 832) discusses the methods of louse control in use in Germany. Heat, fumigation with HCN and other gases, applications for the body and anti-louse powders are mentioned; details should be sought in the original abstract. The dry cleaning of clothing with fat solvents is effective against lice, and the author states that there may sometimes be good reasons for disinfecting barracks, railway coaches, etc.

In the American periodical *Soap* (p. 899) is an account of DDT (dichlor diphenyl trichlorethane), the highly efficient insecticide now so largely used. It is a stomach and a contact insecticide, but in this paper only brief reference is made to its use.

Busvine (p. 601) has found that lice have about the same resistance as bedbugs to HCN and SO_2; these fumigants are not considered suitable for clothing. For the destruction (in bins) of lice and their eggs on garments, liquids such as heavy naphtha or trichlorethylene, equivalent to two gallons per 1,000 cubic feet, are effective within $5\frac{1}{2}$ hours.

Pathology: *Clinical features*: *Tests.*

Chiari (p. 444) describes the pathology of typhus, in patients who had died between the 8th and 15th days of the disease. The essential lesion is a band-like infiltration of lymphocytes (with a few polymorphonuclear cells) surrounding the smaller arteries like a sheath, with swelling (and sometimes necrosis) of the intima, and thrombus formation. These vascular changes are common in the brain, heart, testes, stomach and intestines. Macroscopically there is congestion

of the brain and lungs, and the spleen is enlarged, soft and congested.

ABRIKOSOV (p. 764) states that the essential pathological lesion in typhus is a generalized acute angiitis, especially of arterioles and capillaries, the lesions of which are: necrosis of the walls, thrombosis, cellular proliferation. These changes are found in all organs, especially the brain, where they give rise to a specific form of encephalitis.

SYLLA (p. 445) refers to gangrene in typhus. This is usually restricted to small areas, but may be extensive; thrombosis is usually confined to small vessels, but in rare cases large arteries may be involved. Spasm of the vessels is believed to play the chief part in gangrene and this has been thought to be caused by the formation of nodules in the vessels of the vasomotor centres of the brain, though it often follows exposure to cold and is rare in warm weather. Warmth and various drugs are used to combat spasm, and gangrene is treated on the generally accepted lines.

LAURENTIUS (p. 445) remarks that disturbances of the peripheral circulation occur early in typhus, and that the pallor, slight cyanosis and low blood pressure are to be explained by damage to the vasomotor centres caused by formation of nodules in the small blood vessels [see CHIARI above]. Electrocardiographic changes may show myocardial damage from the third day; they are of the same type as those seen in diphtheria. In treatment the author deprecates the use of hot baths if the circulation is failing; caffeine is useful and saline infusions may be valuable. Strophanthin in small doses cannot yet be dispensed with, and the use of " sympatol " and " cardiazol " is referred to.

FANTA and SIEDEK (p. 234) show that in stuporose patients suffering from typhus, the blood pressure in the cerebral arteries is low, though in the brachial arteries the pressures are reasonably high. In mentally clear patients the cerebral pressures are not so low, though still somewhat below normal. The cerebral pressure is the same as that in the retinal artery, and the latter was estimated by the method of Müller.

STURM (p. 381) relates many of the manifestations of typhus to destructive proliferative thrombo-angiitis, which interferes with the blood supply of the various centres of the brain stem, especially those of the hypothalamus. He discusses differential diagnosis, emphasizing certain features: rapid onset simulating influenza, insomnia, dry leathery tongue, marked shift to the left in the polymorphonuclear index, moderate acceleration of the sedimentation rate, an early positive diazo reaction. The rash is not a reliable guide and the Weil-Felix test may give equivocal results, though its great value is recognized.

WENSCHR (p. 382) states that in the early stages of typhus there occur neurological symptoms, such as intractable headache, deafness and sometimes disorders of speech and twitching of the perioral muscles, which may help to establish diagnosis even in the absence of the distinct exanthem. Therapy consists in relieving the pressure of the cerebrospinal fluid by lumbar puncture, and the administration of strophanthin (to support the cardiovascular system) in strong solution of glucose, which exerts a dehydrating action.

v. BAEYER (p. 831) discusses the mental disturbances in typhus, and describes patients with a syndrome resembling that of Korsakoff; many other types of disturbance are mentioned.

GRUBMÜLLER (p. 899) records six cases of localized neuritis in typhus.

MCCARTHY (p. 762) gives an account of a small outbreak of louse typhus in Ireland; the disease had not been reported there during the

previous 9 years, but the author surmises that it may have persisted during that time in the form of mild attacks resembling influenza. In a description of the symptoms of typhus, HOFF and VON BRUNN (p. 299) note that ambulatory and mild attacks were seen in Russians from endemic areas, and in immunized persons. In these cases, which simulated influenza, the rash sometimes was absent or fleeting.

DENNIG (p. 30), writing from experience in Germany, goes into detail on the differential diagnosis of typhus, which he makes largely by close observation of the clinical signs. He notes that the Weil-Felix reaction, though usually positive on the 5th day, may not be so until the 15th–20th day (in 20 per cent. of cases), or may remain negative. A titre of 1 in 100 is very significant. He states that inexplicably high fever in wounded and frostbitten patients should indicate the possibility of typhus.

MIHALJEVIČ and RADIČEV (p. 446) trace the changes in the blood picture in typhus. At first leucocytosis is common, with neutrophilia and a shift to the left, but this is often followed by leucopenia. Similarly a lymphocytosis may be succeeded by lymphopenia, in turn followed by "convalescent lymphocytosis." White cell counts above 20,000 indicate a bad prognosis, as do progressively increasing counts and marked qualitative changes in the blood picture. LAMPERT (p. 595) also discusses the polymorphonuclear leucocytosis in typhus, which falls to normal during convalescence ; the lymphocyte count is low at first, but rises temporarily towards the end of the fever. There is a shift to the left in the Arneth index.

BENHAMOU (p. 893) has found rickettsiae in the sternal marrow of typhus patients, and describes the various forms seen. In boutonneuse fever the findings are of the same general type, and the author claims that by sternal puncture early diagnosis may be made in these, and possibly other, rickettsial diseases.

ALWENS (p. 687) describes the clinical features of typhus. He remarks that, apart from the effects due to formation of nodules in the blood vessels, toxins play an important part in causing early disturbances of the nervous system, and that convalescent serum is often helpful in combating these. He describes the treatment of typhus in some detail, laying stress on the value of cardiac tonics.

LEWICKI (p. 531) gives an account of the clinical features and treatment of typhus ; for details the original abstract should be consulted. He has found convalescent serum, and transfusion of blood of vaccinated persons, useless.

BURY (p. 31), writing in a German journal of his experience in Poland, has little good to say of the effect of sulphonamides in treatment, except in relation to secondary infections. SCHELLER (p. 299) claims that treatment with chinifortan, a combination of quinine and sulphanilamide, is successful in reducing the febrile period in typhus. Twenty-three cases were treated, with good results ; the total daily dose was 1·05 gm. quinine and 2·1 gm. sulphanilamide.

VAN MEERENDONK (p. 237) states that mepacrine (atebrin) has a therapeutic action in typhus, and that it acts on the causal organism [but produces no proof of the latter statement]. He has found a low blood calcium content in typhus, and therefore gives calcium in a combined treatment which consists of 0·1 gm. mepacrine three times daily, and injections of calcium gluconate or calcium chloride. He claims good results.

KUNERT and BUCH (p. 130) have tested the sera of people from a rural and an urban endemic area of typhus. Many gave positive Weil-Felix reactions at low titre, and some at 1 in 100 or more ; many gave positive results with the Widal test or tests against dysentery bacilli. It is known that the Weil-Felix test may show a rising titre during the first week of an attack of *typhoid*, but the titre does not continue to rise after one week, whereas the Widal shows a continued rise beyond that time. The authors claim that when an anamnestic reaction can be excluded, a Weil-Felix titre of 1 in 200 is diagnostic of typhus, and 1 in 100 is suggestive. Repeated tests are the best means of excluding the fallacies due to anamnestic reactions.

SÜPFLE and FISCHER (p. 688), in a discussion of the Weil-Felix reaction, state that positive results at 1 in 100 are suggestive, but that those at 1 in 200 are not absolutely diagnostic ; on the other hand, titres of 1 in 400 are never seen in diseases other than typhus. Weak positive reactions, which soon became negative, were found in persons who had been vaccinated with an unspecified vaccine. The Weil-Felix test may be weakly or moderately positive in trench fever. The Widal reaction may be strongly positive in persons, suffering from typhus, who have previously been inoculated against typhoid ; this may lead to wrong diagnosis.

MALY (p. 236) regards a Weil-Felix reaction at titre 1 in 100 as suggestive of typhus, one of 1 in 200 as diagnostic. The titre is related to the intensity of the reaction of the body rather than to the severity of the infection. In cases with serious symptoms a low-titre reaction indicates a bad prognosis. Relatively high titres were seen in patients treated with convalescent serum ; this is probably the result of stimulation of antibody formation. The author notes that in doubtful cases the rickettsia agglutination test is useful, and that diagnosis may be made by histological examination of an excised " roseola " of the skin.

SCHÜTZ and MESSERSCHMIDT (p. 132) have shown that the Weil-Felix reaction (at titres of 1 in 200 or more) becomes positive, in typhus, in the following percentages :—

Day ...	3	4	5	6	7	2nd week	3rd week
Per cent. ...	30	48	59	60	65	91	99

The average titre is 1 in 100 on the 3rd–4th day, rising to 1 in 1,600 on the 11th day. At a later stage there are wide variations, and, indeed, in individual cases there are unexplained irregularities. GOETERS (p. 596) also gives figures of the intervals between onset of the disease and the appearance of a positive Weil-Felix reaction ; 85 per cent. are positive by the 7th day. Patients suffering from other diseases may give low titre positive results. He draws attention to the great frequency of mild attacks of typhus in communities in which the disease is endemic. In such communities the fever is said to be a common disease of childhood, and many of the adults, therefore, have some degree of immunity against it.

GAUD (p. 598) shows, in a large series of tests, that there is almost complete agreement between the micro-reaction of Castañeda and Silva and the Weil-Felix reaction, provided that the results of the former are read within 60 seconds, and that the titre of the Weil-Felix is 1 in 200 or more. The Castañeda test is performed on a slide with fresh

blood and a formol-killed suspension of *Proteus OX19* coloured with methylene blue. Its advantages are simplicity, rapidity and freedom from risk to unskilled persons.

Ding (p. 597) states that, among 53 undoubted cases of typhus, the Weil-Felix reaction was negative, or positive only at 1 in 100, in 17. In comment Megaw suggests that a strain of *Proteus* of low agglutinating power may have been used in the tests. The results of other serological tests are recorded in this series.

Writing of the dry blood agglutination test for typhus and other fevers, Ahrens (pp. 529, 600) notes that there were significant differences between the results given with the Berlin and the Leipzig strains of *Proteus OX19*. With the Berlin strain 179 sera, all positive to the Weil-Felix test at 1 in 200, were all positive to the dry blood test; with sera positive only at lower dilutions the results were not so concordant. Heterologous agglutinins (for example to the Flexner group and to *Bact. typhosum*) were present in low titre in some sera positive to *Proteus OX19*, and in a significantly higher proportion than in sera negative to *Proteus*. In comment Megaw points out that this dry blood test is likely to be very useful in making rapid surveys and in bedside diagnosis.

Schafer (p. 600) has used a suspension of *Proteus OX19*, dried on a glass slide; to this is added the serum to be tested, and in positive cases clumping is seen within 10 minutes. This test is purely qualitative, and may be used as a preliminary to the standard Weil-Felix reaction. Tietz and Carlé (p. 133) describe a rapid diagnostic test with a dry reagent apparently connected with *Proteus OX19*, the details of which are not given.

Renoux (p. 894) describes an intradermal allergic reaction in typhus. Injection, into the skin, of a formalized rabbit-lung vaccine leads to a reaction like the positive tuberculin reaction, in 48 hours, in patients recovered from typhus. The intensity of the response appears to vary with the severity of the attack. The test was positive in persons who had received protective vaccine; it was also positive in a few men who had been in North Africa for 7 to 10 years and who were shown, by Giroud's serum-protection test [see below], to be immune.

Robinson (p. 686) reports on typhus in Addis Ababa, where diagnosis is not easy because the rash could be detected in only 6 per cent. of cases. Albuminuria was almost constant. The Weil-Felix reaction was reliable, but did not become positive until the fifteenth day or later in about half the cases. The author has used the Weigl vaccine for diagnosis; he states that in healthy persons injection (presumably intradermal, but this is not made clear) of 1 to 10 million rickettsiae caused a violent local reaction, but that in 54 cases of typhus there was no reaction, even in the early stages when the Weil-Felix was negative, nor was there a reaction in 70 with positive Weil-Felix. This vaccine was successful in protecting the medical staff. In some children the disease was very mild; in certain cases there was reason to believe that the patients had suffered previous attacks.

Clavero and Pérez Gallardo (p. 530) have used the Giroud intradermal test in rabbits (in which suspensions of *Rickettsia prowazeki* from fowl embryos are mixed with the serum to be tested, for 20 to 90 minutes before injection into the animals), and have found that sera from patients convalescent from typhus gave protection, which was not produced by sera from patients with other diseases. The

reaction may be useful in disclosing "inapparent" infections and in estimating the protective value of vaccines and sera.

TRAUTMANN (p. 383) claims that the Weltmann coagulation test gives a clear indication of prognosis, even in the early stages, and that it is helpful in diagnosis. Details are given in the abstract. WARNECKE (p. 689) has found that serological reactions for syphilis become positive in a small proportion of patients with typhus, but the results with the several tests are not consistent. MEYER (p. 689) reports somewhat similar results with the Citochol and the Meinicke tests.

LEON (p. 382) describes a test of urine, to which is added anti-typhus serum, and in which a disk of precipitate forms at the junction of the fluids, and an agglutination test in which to the urine and serum is added a solution of granular mucin. These are said to be useful in typhus.

Vaccination.

CASTAÑEDA (p. 128) has found a Mexican strain of epidemic typhus which grows well in the lungs of mice and which has a high protective value. Vaccines from the mouse-lung epidemic strain and the rat-lung murine strain, when mixed, form a bivalent vaccine whose constitution can be varied at will. A field trial, in Mexico, of immunization with a murine strain only was not satisfactory, and on the assumption that cross protection against the epidemic form of the disease was poor, the author added the epidemic antigen, as indicated above. In the field three doses should be given, but for laboratory workers five are advised.

OTTO and BICKHARDT (p. .129) have tested in guineapigs the protective properties of a number of vaccines of *R. prowazeki*. Mouse-lung, fowl yolk-sac, rabbit-lung and Cox's vaccines all gave good protection, and the authors have recommended mouse-lung and yolk-sac vaccines for human use.

COMBIESCU *et al.* (p. 34) have found that vaccines of *R. prowazeki* prepared from the lungs of mice and dogs, intranasally or intratracheally infected, gave moderate but variable degrees of immunity in guineapigs; better results were obtained when the total dose was given in three doses at intervals of five days than when given in one or two doses. The mouse-lung vaccine was rather better than that from the lungs of dogs; in each case the rickettsiae were killed with formalin. After infection the dogs were kept at 0°C., and usually died in 72 hours.

GIROUD and PANTHIER (p. 35) have shown that guineapigs and rabbits infected with *R. prowazeki* and subjected to the daily injection of bacterial toxins react more severely than normal animals to the infection. The same authors (p. 35) have shown that large quantities of vaccine can be prepared from the lungs of rabbits infected by the intratracheal route. For this purpose it was originally necessary to maintain a mouse-lung strain of rickettsiae in order to infect the rabbits, but this was inconvenient, and the difficulty was overcome by keeping the rabbits in a cold environment and injecting them with suspensions of dead bacteria. The immunizing power of the vaccine is apparently high. GIROUD (p. 36) has shown that a formol saline extract of rabbit lungs infected with *R. prowazeki* has considerable power in producing protective substances in the serum of animals injected with it.

VARELA and PARADA GAY (p. 532) have demonstrated, in a large series of experiments, that the growth of orchitic strains of typhus rickettsiae [murine] in the peritoneum of the rat can be enriched by injection of fresh heart blood of guineapigs intraperitoneally into the rats one, three and four days after infection.

GOLD and FITZPATRICK (p. 32) record two cases of mild laboratory infection with *R. prowazeki* in laboratory workers who had previously been vaccinated with the Cox vaccine. In one case infection probably took place by inhalation, in the other infective material was splashed over the face and eye. The authors point out that if vaccination is adopted on a large scale for the troops, a watch should be kept for mild cases, which may be indistinguishable from influenza and similar fevers. LÖFFLER and MOOSER (p. 28) note that a feature of attacks contracted by inhalation is an influenza-like catarrh of the lower air passages, possibly due to local reaction at the point of entry.

VAN DEN ENDE *et al.* (p. 449) report on two outbreaks of typhus in laboratory workers engaged in experiments during which intranasal inoculation of mice was performed. Experiments with *Chr. prodigiosum* showed that large numbers of organisms are scattered into the air during this operation in spite of the precautions taken. All the subjects had been vaccinated with killed vaccine, either of the rat-lung (murine) or of the yolk-sac (epidemic) type, and many had received several injections of vaccine. The attacks were moderately severe, or mild; the rash was not present in all cases, and in its absence diagnosis was difficult. The Weil-Felix reaction was not helpful in the first week. Rickettsiae could not be recovered by inoculation of blood into guineapigs, and lice fed on one patient did not become infected.

CIUCA *et al.* (p. 381) point out the necessity for vaccination of all workers in laboratories who handle typhus material.

BARTH (p. 134) has cultivated a strain of *Proteus X19* in a medium to which the blood of a typhus patient was added. Guineapigs inoculated with a vaccine from a culture passaged 50 times in this medium developed considerable resistance to typhus, and the author suggests that such a vaccine may afford some protection to man. This would not entail the risk of introducing the rickettsiae of typhus into an uninfected community.

Indeterminate type. Vector: tick.

PATIÑO-CAMARGO (p. 533) has found orchitic strains of rickettsiae in the blood of patients and in rat fleas in Bogotá, where isolated cases of typical typhus had occurred. It thus appears that in Colombia there are three rickettsial diseases:—louse-borne typhus, tick-borne spotted fever, and typhus of murine origin. The rats were *Rattus rattus* and *R. norvegicus*; the fleas *Ceratophyllus fasciatus* and *Leptopsylla segnis*. The same author (p. 900) refers again to the three forms of typhus found in Colombia. He cites three occasions on which murine rickettsiae were isolated in Bogotá, twice from the blood of patients, and once from fleas collected from *Rattus norvegicus*. He (p. 298) reports an outbreak of typhus in Colombia; the type and vector were not determined, but in several cases the Weil-Felix reaction to *Proteus OX19* was positive at titres of 1 in 160 or more.

JIMÉNEZ-MARTÍNEZ (p. 447) describes two forms of typhus which exist in Colombia, the louse-borne and tick-borne types. The tick-borne form is a non-epidemic disease of rural distribution, is especially frequent in the hot season, is transmitted by *Amblyomma cajennense*,

and gives cross immunity with Rocky Mountain fever and the petechial fever of Tobia. Small rodents probably form the reservoir of this disease.

PARKER (p. 448) states that two strains of rickettsiae of Colombian spotted fever showed complete cross immunity with Rocky Mountain fever. He shows that the rickettsiae of this fever, and of the tick-bite fever of South Africa, can persist in the tissues of *Ornithodorus* ticks for very long periods, although these ticks are not known to be spontaneous transmitters. Infected ticks have been used to convey the rickettsiae from one part of the world to another, for experimental purposes.

The dog has been shown to be the reservoir of infection with Brazilian typhus. DE MAGALHÃES and ROCHA (p. 300) have tested the blood of 135 naturally infected dogs from declared foci in Minas Geraes. In most of the dogs with positive Weil-Felix reactions all four strains of *Proteus* (*OX19*, *OX2*, *OXL* and *OXK*) were agglutinated.

In rural areas of São Paulo, where tick-borne typhus is common, TRAVASSOS and VALLEJO (p. 386) have found the preá (*Cavia aperea*) and the capybara (*Hydrochaerus capybara*) susceptible to the disease, though some captured wild were immune, presumably as a result of previous infection. None of the animals was harbouring rickettsiae. Ticks, which transmit the infection to their offspring, are regarded as lasting reservoirs, but the authors think that rodents act as temporary reservoirs, probably causing periodical increases in virulence. The severity of the human disease is greatest in places where the rodents are most numerous. The same authors (p. 387) have transmitted the infection from a capybara to a guineapig by the bites of laboratory bred *Amblyomma cajennense*.

ANIGSTEIN and BADER (p. 386) have discovered in Texas a fever which produces immunity to a Montana strain of Rocky Mountain fever. The only tick found was *Ambylomma americanum*, which has never been shown to be a vector in nature, although other members of the genus *Amblyomma* are proved vectors of Brazilian tick typhus. [See TRAVASSOS and VILLEJO above.] PARKER *et al.* (p. 835) have recovered the rickettsia of Rocky Mountain fever from a batch of *Amblyomma americanum* from Oklahoma. Animals infected with this organism showed complete reciprocal cross immunity with others infected with Rocky Mountain fever, boutonneuse fever, South African tick-bite fever, and the "*maculatum*" infection [see this *Bulletin*, 1940, v. 37, 254]. Rocky Mountain fever vaccine protected against this rickettsia. There was no cross immunity with Q fever, but there was some evidence of partial cross immunity with epidemic typhus. Two outbreaks of Rocky Mountain fever closely associated with *A. americanum* are described.

PHILIP (p. 533) gives a list of the known and potential vectors of Rocky Mountain fever in the United States. DAVIS (p. 533) has shown that *Ornithodorus parkeri* is capable of transmitting Rocky Mountain fever to guineapigs, and suggests that it may help to maintain the disease in animals in nature.

BRIGHAM and WATT (p. 238) have found three highly virulent strains of the rickettsia of Rocky Mountain fever in Georgia, where the strains usually recovered are generally mild.

In a histological examination of the brain of a patient who had died from Rocky Mountain fever, SCHEINKER (p. 690) found miliary granulomata associated with changes in the capillary vessels. The cells

of the granulomata appeared to have been derived from the adventitial cells of the capillaries; they had proliferated, and the final stage of the process was necrosis of the cells and disorganization of the capillaries.

An account of the clinical features and treatment of Rocky Mountain fever is given by BAKER (p. 902), who refers to the probable value of hyperimmune rabit serum. He notes that the incidence and severity of the disease vary greatly from year to year.

TOPPING (p. 837) has extended his work on the therapeutic and protective value of concentrated hyperimmune serum of rabbits in experimental Rocky Mountain fever. In treatment it is effective in guineapigs 120 hours after infection (*i.e.* on the second day of fever), but in large doses only. Results in man indicate a definite value in a dose of 1·0 cc. per kgm. of body weight, even when given (intramuscularly) on the third day of fever or later. The death rate in a considerable series of patients was reduced more than would have been likely by chance. TRAVASSOS and VALLEJO-FREIRE (p. 768) have confirmed the work of TOPPING by demonstrating that serum from rabbits hyperimmunized with rickettsiae of the tick-borne group (São Paulo) has a pronounced curative effect in the first days of fever in experimental animals. It also neutralizes the rickettsiae *in vitro* and *in vivo*, confers passive immunity and prevents infection when injected during the incubation period.

STEINHAUS and PARKER (p. 691) failed to find evidence of any therapeutic value in certain sulphonamides, mepacrine and tyrothricin in experimental Rocky Mountain fever.

PARKER and STEINHAUS (p. 691) have found that samples of tick-tissue vaccine against Rocky Mountain fever had maintained full protective power after having been kept for 12 to 14 years at 34°–40°F.

In discussing South African tick-borne typhus, GEAR (p. 591) states that although the animal reservoir hosts have not been determined, the striped mouse and the gerbil are suspected; the dog is believed to be a conveyor of infected ticks rather than a reservoir of infection. In most cases the disease is transmitted by larval ticks, which are so small as to escape notice. Agglutinin titres to *Proteus OX19* and *OX2* are low, but a patient agglutinating only *OX2* is almost certainly suffering from this fever; *OXK* may also be agglutinated, but as a rule in very low titre.

MOUSTARDIER (p. 594) reports several cases of eruptive fever in Brazzaville, which were probably tick-borne typhus. BARLOVATZ and JOUKOVSKY (p. 37) describe from the Belgian Congo a sporadic disease which clinically closely resembled boutonneuse fever, but in which there was no evidence that ticks were implicated in transmission. The Weil-Felix reaction was strongly against transmission by fleas or mites.

CAVAZZI (p. 901) from the Ethiopian highlands records five cases of boutonneuse fever. The attacks were severe, the tache noire was present and the reactions to *Proteus OX19* were negative, or positive only in moderate titre, except in one case positive at 1 in 640.

SINGH (p. 901) reports a case, probably of tick typhus, from Meerut, India; the Weil-Felix reaction was negative.

From the far eastern U.S.S.R. ROTENBURÇ (p. 300) describes tick fever, which conforms to the picture of tick-borne typhus. The vectors and reservoir hosts are as yet unknown.

Q fever.

Derrick *et al.* (p. 302) state that human infection with Q fever may result from :—(1) Direct attacks from native ticks (*Ixodes holocyclus*) in the absence of cattle ; (2) Direct infection from the body tissues and fluids of infected cattle ; (3) Indirect infection from infected cattle by the tissues or excreta of ticks (especially *Boophilus annulatus microplus*, but perhaps also *Haemaphysalis bispinosa*). The third is probably the most important. Inhalation of dried faecal dust of the ticks is a possibility. The cow probably plays an important part in the transmission of Q fever to man.

Ixodes holocyclus is the tick which most commonly attacks man in Australia ; it is a potential vector of Q fever, as has been proved experimentally by Smith (p. 388). Infection is not, apparently, passed from adult ticks to their progeny. Infection was not found in a considerable number of ticks and larvae collected in nature from bandicoots, and the author suggests, as a result of experiment, that bandicoots soon cease to be infective. Ticks may cause infection in man either by infecting domestic animals from which man may become infected, or directly by bite.

Smith (p. 601) shows that *Haemaphysalis bispinosa*, a tick which infects cattle in Queensland and New South Wales, can transmit Q fever experimentally by bite ; it is probably responsible for some transmission in nature. *Ornithodorus gurneyi* can be infected but failed to pass on the infection in the experiments recorded.

Davis (p. 903) has established that *Ornithodorus moubata* and *O. hermsi*, infected with *Rickettsia diaporica* as nymphs, were able to transmit by bite (after reaching adult stage) for 428 and 772 days respectively, and harboured the rickettsiae for 670 and 979 days. Fasting had no effect on virulence. Progeny of *O. moubata* were infective ; those of *O. hermsi* not. It is possible that the former tick is a vector in South Africa, though Q fever has not been recognized there.

Parker and Steinhaus (p. 769) have found the rickettsiae of Q fever (both American and Australian forms) in the organs of infected animals for varying periods, but in the kidneys they were repeatedly found for as long as 120 days. The rickettsiae persisted for 100 days in the seminal vesicles, but tests produced no evidence that the disease could be transmitted during the act of copulation. Samples of urine from the animals were sometimes positive.

Trench fever.

A comprehensive account of the clinical features, and the different clinical types, of trench fever is given by Marie (p. 903). The details should be sought in the original abstract. Kerger (p. 136) also gives a clinical description of trench fever, in which he stresses the protean nature of the symptoms. These were all described in the British literature of the war of 1914–18. v. Bormann (p. 838) describes the fever, with notes on the varied manifestations seen in German troops in Russia.

Windorfer (p. 446) notes the importance of severe pain in the shin bones. These are increased by warmth, and may persist without the periods of respite which have been regarded as characteristic of the disease, and the pains may shift to the knees and thighs and to joints. Paroxysms of fever at five-day intervals may or may not occur.

For the relief of pain aspirin or pyramidon may suffice, but morphine may be needed; few of the author's cases were admitted to hospital.

Sylla (p. 38) gives a clinical description of trench fever. He regards it as a louse-borne infection, but is not satisfied that it is purely a rickettsial disease.

Arneth (p. 301) discusses the leucocyte picture; there is leucocytosis with a shift to the left, followed by great increase in the number of large mononuclears and large lymphocytes. He makes some observations on treatment.

Werner (p. 387) discusses the possibilities of laboratory diagnosis of trench fever.

Westphal (p. 692) records a fever seen in Eastern Ukraine. The pyrexia was of short duration, the spleen enlarged and there was a macular rash. Shin-bone pains were absent, but the author does not exclude the possibility that this was a form of trench fever.

Charles Wilcocks.

MALARIA.

i. Sheinker, K. P. [**Epidemiological Rôle of Malaria Parasite Carriers in an Endemic Area.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1943, v. 12, No. 4, 24–32. [In Russian.]

ii. Sarikian, S. J. [**Parasite Carriers in relation to an Epidemic Outbreak of Malaria in Central R.S.F.S.R.**] *Ibid.* 32–40. [In Russian.]

iii. Remennikova, V. M. [**The Importance of Carriers of *P. vivax* and *P. falciparum* in the Epidemiology of Malaria.**] *Ibid.* 47–57. [In Russian.]

iv. Shishliaeva-Matova, Z. S. [**Epidemiological Rôle of Parasite Carriers in Malaria.**] *Ibid.* 57–64. [In Russian.]

These four papers are devoted to observations on symptomless carriers of malaria parasites, both of the contact and convalescent types. The main object of these studies is to establish the incidence of carriers in endemic areas, to determine their epidemiological significance; and to devise methods for their control.

i. Sheinker records observations carried out in the Caucasus, in the course of three epidemic seasons (May–October of 1938, 1939 and 1940), in a settlement with about 300 inhabitants who were examined once a month.

The number of carriers varied as follows: in 1938 there were 77 persons; in 1939, 48; and in 1940, 21. During the period covered by these observations symptomless carriers constituted 43·7 per cent. of all the cases which showed parasites (total 546). About two-thirds of the cases were benign tertian, less than one-third subtertian and only a few quartan. As regards the age-incidence of carriers, this was relatively higher in children up to the age of 15 than in adults. An analysis of the available material has shown that the majority of carriers had previously manifested clinical symptoms [= convalescent carriers].

The proportion of carriers in the community was considerably reduced by treatment, *viz.* in 1938 they represented 26·3 per cent. of the population, while in 1940 the percentage was only 6·2.

In the majority of carriers (71·6 per cent. with *P. vivax* and 73·3 per cent. with *P. falciparum*) the spleen remained normal, therefore in mass surveys the size of the spleen alone, unaccompanied by blood examination, does not provide a true picture of the local prevalence of malaria.

It has been demonstrated experimentally that, in spite of the relatively small number of parasites present in the blood of carriers, mosquitoes are readily infected from them. Parasite carriers are thus of considerable epidemiological importance.

It is suggested that in malarious localities the following measures should be taken : (*a*) the detection of all carriers among those who have suffered from malaria during the preceding and current years ; (*b*) the detection and thorough treatment of clinical cases ; and (*c*) the periodical examination of the blood of patients between the cycles of treatment, and the reduction of the intervals between these cycles if parasites are still present.

ii. Sarikian's observations were made in two localities of central Russia, the inhabitants of which were examined twice a year in the course of two years (1935–6).

In one settlement, with a population of 1859, there were 514 parasite carriers and 560 cases of clinical malaria, the parasites being *P. vivax* and *P. falciparum*. The parasite rate for this settlement was 27·9 per cent., the percentage of carriers being 27·6 in 1935 and 5·2 in 1936. It was found that 38·9 per cent. of parasite carriers, who belonged to different age-groups, have never shown any clinical symptoms [= contact carriers]. This category of carriers represents the most dangerous element, since they usually escape detection.

In the second community a single examination of each inhabitant in 1935 revealed 300 parasite carriers (50·7 per cent.), of whom 73 per cent. had *P. vivax* and 18·1 per cent. *P. falciparum*. In 1936 the percentage of carriers dropped to 21·3 per cent.

In general, it was observed that after an epidemic outbreak of malaria, a large number of parasite carriers appear among the population in the following spring, the majority without a previous history of malaria.

The author emphasizes the importance of detecting and treating carriers.

iii. Remennikova reports work carried out in a rural settlement of Uzbekistan (Central Asia), with a very high incidence of malaria (11·5 per cent. of the population in 1938, 11·8 per cent. in 1939, 30·5 per cent. in 1940, and 42·75 per cent. in 1941). In 1942 the parasite rate of the general population was 8, varying in different groups from 28·8 among the hospital staff to 1·5 in a collective farm. The rate was especially high (42·9) in children up to the age of 12.

The comparative epidemiological rôle of parasite carriers was demonstrated by feeding mosquitoes on carriers and on patients suffering from subtertian and benign tertian malaria. The percentage of mosquitoes infected from carriers proved to be very high (75 for *P. vivax* and 82·6 for *P. falciparum*), in spite of the extremely scanty number of gametocytes present in their blood, while the percentage infected from clinical cases proved to be about the same for *P. vivax* (85) but much lower for *P. falciparum* (38·2). However, this low figure may be due to the fact that the subtertian patients were in the early phase of infection, with immature gametocytes. The number of oöcysts in mosquitoes infected from carriers reached 250 in the case of the subtertian parasite and only 25 in the case of the benign tertian

parasite, while in those fed on clinical cases of both types of malaria the number of oöcysts exceeded 250.

An analysis of the available data revealed that, even in the months (August-September) when the incidence of malaria reaches its maximum, the number of clinical cases—usually regarded as the most important from the epidemiological point of view—is about the same as that of symptomless carriers.

Thus, in spite of the low degree of the infection, parasite carriers represent an effective source of infection for mosquitoes. They have a considerable influence upon the course of the epidemic curve, because of their large numbers, and they are all the more dangerous because owing to the cryptic nature of the infection in them they usually escape detection.

iv. The main object of the observations recorded by Shishliaeva-Matova was the determination of the nature and duration of infection with *P. vivax* and *P. falciparum* in carriers. The work was carried out at a collective farm in Central Asia, where, in 1942, malaria parasites were found in 296 persons out of a total of 769. Of this number 140 were symptomless carriers; in 43 the carrier state was preceded by clinical manifestations; in 10 this sequence was reversed; while only in 103 were the parasitological findings associated with symptoms of disease.

During the last few years the population of the farm has undergone prophylactic and therapeutic treatment with acriquine [= atebrin] and plasmocide [= Fourneau 710 or rhodoquine, this *Bulletin*, 1934, v. 31, 174 and 178]. Parasite carriers were found both among treated and untreated persons.

The duration of infection in carriers was studied in 21 subjects whose blood was examined and temperature taken several times a month: the infections with *P. falciparum* lasted up to 138 days, those with *P. vivax* up to 150 days. The parasites are usually very scanty and in many cases they can only be detected after the examination of several thick blood films.

The epidemiological importance of carriers was demonstrated by feeding mosquitoes on them. The mosquitoes could be readily infected with malaria parasites even when the gametocytes were so scanty in the blood that they were actually undetectable in the thick film. Moreover, the infection rate was comparable to that in mosquitoes fed on cases of clinical malaria. Systematic treatment reduces the number of parasites in the blood considerably, and results in the lowering of the infection rate in mosquitoes to one-third.

C. A. Hoare.

SHISHLIAEVA-MATOVA, Z. S. [**Study of the Reservoir of Malaria Infection in a Focus with Abundant Mosquitoes, and the Epidemiological Effectiveness of Chemoprophylaxis with Acriquine and Plasmocide.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1943, v. 12, No. 4, 41–7. [In Russian.]

The observations recorded in this paper were carried out at a collective farm of the Samarkand district (Central Asia), inhabited by a non-immune community, living near mosquito breeding places, and in close proximity to the populations of hyperendemic foci of malaria. In 1940 the parasite rate in this community continued to be high (41·5 in April, 23 in July, 20 in October) in spite of prophylactic and therapeutic treatment.

The object of the present investigation was to determine (1) the effect of combined "schizotropic" [= anti-schizont] and "gamotropic" [= anti-gametocyte] treatment in reducing the incidence of malaria both among the population and the mosquitoes, and (2) the anti-epidemic importance of these measures under local conditions. Accordingly in 1941 the following standard scheme was adopted both for patients and carriers: (1) anti-relapse treatment (daily dose of 0·2 gm. acriquine and 0·04 gm. plasmocide); (2) Theraputic treatment (0·3 gm. acriquine and 0·06 gm. plasmocide daily for three days; interval of five days; daily treatment for three days; interval of 10 days; daily treatment for three days). After two cycles of this treatment, followed by an interval of five days, the patients underwent chemoprophylactic treatment with 0·2 gm. acriquine and 0·04 gm. plasmocide daily for two days, followed by an interval of five days.

The examination of up to 98 per cent. of the inhabitants (125–217) in the course of 1941 revealed a parasite rate varying at different periods from 4·2 to 29·7, while the incidence of malaria was from 8 to 63, most of these (65·5 to 100 per cent.) being symptomless carriers. The infections were due chiefly to *P. vivax* and *P. falciparum*, with a small number of *P. malariae* cases.

The infection rate in wild mosquitoes (mainly *A. maculipennis* var. *sacharovi*) varied from 1·8 to 50 per cent. in 1940, before treatment with plasmocide was introduced; while in 1941, after its introduction, the percentage of infected mosquitoes was from 2 to 14·6.

In general, systematic treatment with acriquine and plasmocide has not succeeded in producing a notable reduction of the parasite rate in the population, though the use of plasmocide has reduced the infection rate in mosquitoes. It is concluded that in localities with a high density of vectors drug treatment should be reinforced by larvicidal measures. *C. A. Hoare.*

PARADE, G. W. Einheimische Malaria. [**Malaria in Austria.**] *Münch. med. Woch.* 1944, Jan. 28, v. 91, No. 3/4, 34–6.

Two cases of benign tertian malaria occurred in Innsbruck in the summer of 1942. From the histories of the cases and an examination of local conditions, it was concluded that their infection was acquired in Innsbruck; the patients, a woman and her child, lived near a large camp of workers who had come from southern Italy and the Balkans, and it was believed that these workers infected the local anopheline mosquito (*A. maculipennis*) [variety not mentioned] since malaria is not endemic in Innsbruck. This was the only point of special interest in the cases. *J. F. Corson.*

WILLIAMSON, K. B. **Investigation of Ferruginous Waters in relation to the Breeding of Malaria-Carrying Mosquitoes.** 15 mimeographed pp.

This investigation, which is stated to be not yet complete, was made in England, chiefly in the London area. Samples of water were collected at Kenwood (Hampstead Heath), at Caesar's Camp (on Wimbledon Common) and at Arbrook Common (near Claygate); water sources around Malvern, Worcestershire, were also examined. The chemical and physical examinations included the estimation of iron, ammonia, phosphates and other constituents, the *p*H, electrical potential, and

relative colour intensity. In the biological examination the presence or absence of vegetation, peaty organic matter, algae and bacteria was noted, and controlled experiments with bred-out larvae of *Anopheles maculipennis* var. *atroparvus* were made. The author emphasizes the need for taking several samples at the same time from different parts of the same stream or pond, from surface and deep levels of the water, and from different waters even when they are close together, as so much variation occurs. For similar reasons it is necessary to take samples frequently and to make examinations on the spot as well as in the laboratory.

In the experiments with anopheline larvae it was found, (1) that all larvae died in all the waters tested when no food was added, (2) the larvae grew well in all the samples and controls (rain and distilled water) when food was added. The author concluded that the waters were not harmful to the larvae except that they were deficient in larval food, this being primarily attributable to lack of algae whose growth is probably inhibited by the presence of colloidal iron and associated peaty substances in the water.

The author lays emphasis on the need for the presence of excess of rotting vegetation to provide buffer substances for maintaining the stability of the colloidal state of the iron present.

Ferruginous waters may be classified, provisionally, as follows :— (1) Water whose iron is derived from underground mineral sources such as pyrites ; (2) water whose iron is composed partly of organic compounds formed by humus with the iron of the soil, in marshy ground, and partly of iron contributed directly by the humus ; (3) water whose iron is derived solely from contained rotting vegetation.

Previous investigations by the author [this *Bulletin*, 1935, v. 32, 429 & 731 ; 1937, v. 34, 367 & 941], which were carried out in Malaya, are briefly referred to. [For other references to ferruginous water in relation to vegetation and mosquitoes see Senior White, this *Bulletin*, 1926, v. 23, 707 ; Boyd, *ibid.*, 1931, v. 28, 166 ; Hancock, *ibid.*, 502 ; Fritsch, *Proc. Roy. Soc. London, Ser. B*, 1907, v. 79, 197.] *J. F. Corson.*

Harper, J. O. **Notes on the Swarming of Males of *A. funestus* (Giles), in East Africa.** *East African Med. J.* 1944, May, v. 21, No. 5, 150–51.

"1. A number of male *A. funestus* were observed assembling inside the threshold of a thatched dwelling in Samia Location, Central Kavirondo, Kenya Colony, some ten miles distant from Lake Victoria Nyanza.

"2. Between 6-15 p.m. and 6-35 p.m. the swarm increased in numbers from approximately 50–100 to 400–500, and by 6-40 p.m. it had dispersed or disappeared.

"3. Sixty-six mosquitoes captured from the swarm were male *A. funestus*."

Baxter, C. P. & Zetek, J. **The Anopheles of Panama with special reference to Hand Lens Identification and Notes on Collecting and Care of Specimens.** *Amer. J. Trop. Med.* 1944, Mar., v. 24, No. 2, 105–23, 2 charts, 2 figs & 6 pls. [17 refs.]

The contents of this paper are somewhat elementary. It should, however, be useful to any entomologist who, without previous

experience in work with *Anopheles* mosquitoes, finds himself engaged in anti-*Anopheles* work in Panama or adjacent territories. A remarkably compact collecting outfit is described but this appears to be adapted to the authors' personal methods of field work.

There are two plates with figures of hind legs of Panama *Anopheles*, one of female palps and two of wings; the sixth plate is a mediocre diagram of the adult anopheline. It is intended that specimens should be identified by comparison with these figures and the identification clinched by reference to some very brief notes on the species in the text.

The bibliography attached to the paper omits reference to KOMP, [1942, *The Anopheline Mosquitoes of the Caribbean Region*, this *Bulletin* 1943, v. 40, 808]. The entomologist might as well commence his work by using Komp's excellent booklet since eventually he will certainly find the paper under discussion insufficient. *John Smart.*

LENDRUM, A. C. **Fixation of Tissues from Cases of Malaria.** [Memoranda.] *Brit. Med. J.* 1944, July 8, 44.

In tissues fixed in formalin the blood and formalin produce a dark-brown deposit which closely resembles malarial pigment. This can be removed from sections by picric alcohol (BARRETT, *J. Path. & Bact.* 1944, v. 56, 135) but Lendrum has found that malarial pigment is also removed by picric alcohol. Although not by itself satisfactory for paraffin sections (MALLORY, "Pathological Technique" 1938, p. 39) formalin is less lytic to erythrocytes than other common fixatives. The following procedure overcomes these difficulties.

Fix in 10 per cent. formalin for 3 to 6 hours (or in formol sublimate if the tissues are less than 6 hours dead); transfer to 5 per cent. aqueous mercuric chloride and leave for 5 to 20 days.

This is an ideal method for human tissues and is recommended for malarial tissues but, as there is still a slight risk of formation of a deposit, suspected malarial tissues should also be fixed in formalin-free fluids, the following method being suitable.

Fix in an aqueous solution of 2·5 per cent. potassium bichromate and 5 per cent. mercuric chloride for 6 hours; transfer to 5 per cent. mercuric chloride. *J. F. Corson.*

SINGH, J. & BHATTACHARJI, L. M. **Rapid Staining of Malarial Parasites by a Water Soluble Stain.** *Indian Med. Gaz.* 1944, Mar., v. 79, No. 3, 102–4. [14 refs.]

This stain is offered as a substitute for the usual Romanowsky stains, the ingredients for which are now costly and difficult to obtain in India. Two staining solutions are prepared as follows:

Solution I. Dissolve 0·1 gm. of medicinal methylene blue in 100 cc. of tap water, add 0·6 cc. of a 1 per cent. solution of H_2SO_4, then add 0·1 gm. of potassium dichromate; boil for three hours, cool, add 2 cc. of a 1 per cent. solution of KOH, drop by drop to dissolve the precipitate, and filter.

Solution II. Dissolve 1 gm. of water-soluble eosin in 500 cc. of tap water.

Method of staining. For thin blood films—fix in methyl alcohol, put into solution I for 30 seconds, wash in tap water of *p*H 6·2–6·6, put into solution II for one second, wash, and replace in solution I for

30 seconds, wash and dry. For thick films—put into solution I for 10 seconds, wash for two seconds, put into solution II for one second, wash, restain in solution I for 10 seconds, wash and dry.

The staining solutions keep well in separate jars and can be used repeatedly. Blood films several weeks old can be stained satisfactorily. Staining is rapid and the results compare favourably with those obtained with the usual Romanowsky stains. The solutions are easily prepared and azur stains, alcohol or acetone, glycerin and distilled water are not needed. *J. F. Corson.*

HEIMBERGER. Neue Darstellungsweise der Malariaplasmodien. [**New Method of demonstrating Plasmodia.**] *Deut. med. Woch.* 1943, Nov. 26, v. 69, No. 47/48, 816–17, 1 fig.

The author advocates a method of blood-film making for the diagnosis of malaria which is intermediate in character between the usual thick film and ordinary thin film. A drop of blood about half the size of a lentil is spread into a thick film and allowed to dry in the air. When quite dry the blood film is cleared by breathing on it. This causes the red blood corpuscles to haemolyse and disintegrate, so that when the film is again dried and stained, a uniform background, clearer than that of the usual thick film, is obtained. In films thus prepared the malaria parasites, blood platelets, leucocytes and other objects are clearly distinguishable. The method is only applicable to freshly prepared films. If the films are old some degree of clearing can be obtained by exposure to steam. For staining, the method recommended is May-Grünwald solution followed by Giemsa, but presumably any of the methods for fixing and staining blood films may be used.

C. M. Wenyon.

PACKCHANIAN, A. A. **Malaria Thick Films contaminated with Excretions of Flies containing Flagellates (Herpetomonas).** *Amer. J. Trop. Med.* 1944, Mar., v. 24, No. 2, 141–3, 1 fig.

During the course of examination of stained thick blood films for malarial parasites, in two films flagellates of the leptomonas type were encountered. It was suspected that the flagellates might have been deposited on the films by flies during the process of drying. To test this point laboratory-bred house flies, which were infected with *Herpetomonas muscae domesticae* by feeding them on cultures of the flagellate, were allowed to feed on thick blood films in process of drying. It was found that flagellates were deposited on the films by the flies. [The possibility of house flies contaminating exposed blood films with flagellates has been noted by the reviewer in his "Protozoology," p. 1320.] *C. M. Wenyon.*

i. POLUMORDVINOV, A. D. [**Pernicious Form of Tertian Malaria occurring in Riazan Province.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1943, v. 12, No. 4, 65–71. [In Russian.]

ii. TROITSKY, S. A. [**Severe Tertian Malaria in Gorky Province in 1941.**] *Ibid.* 71–5. [In Russian.]

Both these papers deal with cases of a pernicious or fulminating form of malaria due to *P. vivax* which has been observed among children in the central areas of Russia [see also this *Bulletin*, 1943, v. 40, 436, 668; 1944, v. 41, 257].

i. Polumordvinov's cases occurred in the Riazan Province, where 34 children under the age of 16 died from a fulminating type of malaria due to *P. vivax* in the spring of 1941. The distribution of these cases was not focal and all the evidence suggested that they represented relapses in the spring of incompletely treated recent infections, mostly during the second half of the preceding year. As a rule, death took place some time after the initial paroxysm. The children who succumbed showed no constitutional anomalies, the main subjective symptom being severe headache. The author recommends the following measures against the fulminating type of malaria : (1) registration of all children with a history of malaria during the second half of the year ; (2) thorough treatment of such cases ; (3) early anti-relapse treatment ; (4) immediate treatment of all children manifesting clinical symptoms of malaria during the first half-year, especially if accompanied by severe headache.

ii. Troitsky's observations were made in the Gorky Province, where 61 fatal cases of benign tertian malaria were recorded in 1941 among children between the ages of 3 and 14. There is evidence that isolated cases of this fulminating form of tertian malaria occurred in the past but in the present instance there was an epidemic outbreak. The acute course of malaria in children is attributed to a change in the reaction of the host's organism rather than to any difference in the virulence of the parasites. This may have been influenced by meteorological factors, such as frost, accompanied by snow and rain, which lasted till the end of the first third of June. It is suggested that such cases and especially their fatal termination can be prevented (1) by a general intensification of anti-malarial measures, and (2) by earlier and more energetic treatment from the very first paroxysm.

C. A. Hoare.

BERLIN, B. M. [**Exogenous and Endogenous Manifestations in Malaria Psychoses.**] *Trudy Molotovskovo Meditsinskovo Instituta.* [=*Trans. Molotov med. Inst.*] 1942, No. 21, 247–60. [In Russian.]

It is generally held that malarial psychoses represent an exogenous reaction which is characteristic for the given type of infection. They are most frequently manifested clinically as symptom-complexes of the Bonhoeffer type.

The present observations are based on 16 cases of psychosis in patients suffering from benign tertian (10), quartan (4) and subtertian (2) malaria. The author concludes (*a*) that there are no specific forms of psychosis associated with malarial infection, though such psychoses may exhibit certain peculiarities ; and (*b*) that malarial psychoses can be provoked by any of the three types of malaria.

The clinical and psychopathological picture of malarial psychoses varies considerably. In most cases it manifests a reaction of the Bonhoeffer type, but sometimes it assumes the character of exogenous reactions of an unusual type, while in other cases malaria provokes an endogenous disorder (chiefly maniacal depressive psychosis). Furthermore, there appears to be a biological affinity between the latter condition and malaria, expressed in the cyclical form of both diseases and in disorders on the part of both the emotional sphere and the vegetative nervous system. In some cases the malarial infection does

not affect the character of endogenous psychosis, while in others it becomes superimposed on the latter, conveying to it an exogenous aspect in the form of a delirious syndrome. *C. A. Hoare.*

GALPERIN, E. P. **Quinoline Compounds with Side Chain in Position.** *Amer. Rev. Soviet Med.* 1944, Feb., v. 1, 220. [Summary prepared for *War Medicine*, Chicago.]

Galperin says that among anti-malarial compounds of the quinoline group synthesized in the Union of Soviet Socialist Republics numerous preparations have a diethylaminoalkylamine chain joined to the quinoline in position 8. The majority of these compounds have proved active against malaria. In the synthesis of chemical isomers with an identical chain joined in position 4 instead of 8, two questions arise : first, whether the anti-malarial properties are preserved and, second, whether these preparations are analogous to quinine in acting specifically on the asexual forms of the parasite (schizotropic action) or whether their action is directed against the sexual forms (gametotropic action), as observed with the majority of compounds with the side chain in position 8.

The author found that four compounds, quinolines 45, 50, 52 and 56, with a diethylaminoalkyl chain joined to a 6-methoxyquinoline nucleus by an amino group in position 4 exert a schizotropic effect on avian malaria. The position of the diethylaminoalkylamine joined to the 6-methoxyquinoline determines the biologic action of the preparation ; in position 8, the preparation has both schizotropic and gametotropic properties, and in position 4 schizotropic action only.

Preparations of this group are of interest as possible substitutes for quinine.

LOWE, J. **Novarsenobillon and Mapharside in the Treatment of the Attack of Malaria.** *Indian Med. Gaz.* 1944, Mar., v. 79, No. 3, 97–9, 2 charts.

NIVEN [this *Bulletin*, 1942, v. 39, 258] has tested mapharside against naturally acquired infections of malaria in Malaya. He concluded that it had a dramatically rapid effect upon the sexual and asexual forms of *P. vivax* but was relatively inert against *P. falciparum* and *P. malariae*. Lowe treated about 20 cases of naturally acquired malaria. Neoarsphenamine was given intravenously in three doses of 0·15, 0·3, 0·45 gm. respectively, at 4–5 day intervals. In cases of benign tertian malaria, the parasites rapidly disappeared from the blood ; but relapses occurred as frequently as after treatment with quinine for one week. Moreover patients who had a latent infection with *P. falciparum* were not protected against this second infection. Only a few patients were treated with mapharside [mapharsen, or *m*-amino-*p*-hydroxyphenylarsine oxide], the dose being 0·04 gm. This compound was probably slightly less effective than neoarsphenamine.

In patients infected with *P. falciparum*, neither neoarsphenamine nor mapharside had any significant therapeutic effect. *F. Hawking.*

BOL. OFICINA SANITARIA PANAMERICANA. 1944, Jan. & Feb., v. 23, Nos. 1 & 2, 21–48 ; 120–40. Terminología del paludismo (vocabulario). [**Terminology of Malaria**].

This is a glossary of terms in general use in all branches of malariology. The terms are given in Spanish, English, French and Portuguese, and are defined in Spanish.

Das Gupta, B. M. & Siddons, L. B. **Organic Arsenicals in the Treatment of Simian Malaria.** *Indian Med. Gaz.* 1944, Mar., v. 79, No. 3, 99–101.

Six monkeys weighing 1½–2 kgm., infected with *P. knowlesi*, were treated with neoarsphenamine. Doses of 7·5–45 mgm. of the drug, given by daily intravenous injection, had little or no parasiticidal action; with doses of 60–90 mgm., given by daily intravenous injection, the infections were incompletely controlled; treatment with 100 mgm. removed the parasites but the animal died from the toxic effects. Six similar monkeys were treated with mapharsen [*m*-amino-*p*-hydroxyphenylarsine oxide] in doses of 4–10 mgm. for monkeys weighing 1½–3 kgm.; no significant action against *P. knowlesi* was observed. *F. Hawking.*

Siddons, L. B. & Bose, A. N. **The Action of 2-Chloro-7-Methoxy-5 (8-Diethyl-Amino-Butyl) Amino-Acridine on Simian Malaria.** *Indian Med. Gaz.* 1944, Mar., v. 79, No. 3, 101–2.

This compound differs from mepacrine in being a butyl-acridine derivative, while mepacrine is an amyl-acridine derivative. The dosage given was 5–25 mgm. daily for about three days to monkeys weighing approximately 2 kgm. Eight monkeys were treated. These preliminary results show that the compound had a powerful parasiticidal action upon *P. knowlesi* and comparative trials with mepacrine are contemplated. *F. Hawking.*

Maier, J. & Coggeshall, L. T. **The Duration of Immunity to *Plasmodium knowlesi* Malaria in Rhesus Monkeys.** *J. Exper. Med.* 1944, Apr. 1, v. 79, No. 4, 401–30, 7 charts. [30 refs.]

With a view to determining how long monkeys retain immunity after a malarial infection, a series of experiments was carried out, in which, after complete eradication of a *Plasmodium knowlesi* infection by administration of sodium sulphathiazole, the monkeys were reinoculated after varying intervals. It has already been amply demonstrated that a *P. knowlesi* infection can be completely eliminated by a dose of 1 gm. of sulphathiazole, but in the experiments recorded here a total quantity of 4·6 to 6 gm. was administered intraperitoneally in doses three times a day for three days, in order to leave no doubt that the infection had been completely wiped out. In two cases, the infection resulting from a standard dose of parasites was eradicated by the course of sulphathiazole commenced on the second and fourth day, and three and ten weeks later reinoculation was carried out. In neither case was there any evidence of immunity, the resulting infections developing as in normal monkeys and passing to a fatal issue. In other cases the infection, normally fatal in every case, was controlled by administration of quinine or immune serum in such a way that survival of the infection occurred. The infections were allowed to continue for about three weeks, when they were eliminated by sulphathiazole. After a period of freedom from parasites, lasting 37 to 414 days, the monkeys were reinoculated. In all cases the monkeys had acquired control of the original infection before sulphathiazole was administered. From the character of the infections which resulted in every case, it was clear that a considerable degree of immunity to reinfection existed, except in one of two reinoculated on the 414th day. One monkey died of a typical acute infection, whereas the other survived.

In another series of six monkeys, the acute infection was controlled by quinine hydrochloride, administered during the first week, and the chronic infection resulting was allowed to run for 71 to 218 days, when it was eliminated by sulphathiazole. Reinoculation was carried out in three monkeys after a 20-day period of freedom from parasites. All these failed to become infected. In the case of the remaining three monkeys of this series reinoculation was made after 289, 351 and 361 days. One of these developed a mild infection. The two others developed acute fatal infections. In another series of monkeys the acute infection was controlled by quinine or immune serum, and the chronic infection resulting was eliminated by sulphathiazole after it had continued for two months or longer. Reinoculation carried out after a four-week period of freedom failed to produce infection in three monkeys. Treatment with sulphathiazole was carried out to eliminate any possible undetected infection, and a second reinoculation made after a longer interval. The process of treatment and reinoculation was repeated, but after each treatment the interval before reinoculation was increased. When the interval was five weeks, some (but not all) monkeys resisted reinfection, and those that became infected survived. After fourteen weeks, all reinoculated monkeys became infected, and again all survived; in fact, no deaths occurred till the interval was twelve months. After this, some, but not all, of the monkeys died of acute infections, indicating that some had no immunity remaining after twelve or more months. When the reinoculations were carried out with heterologous strains of *P. knowlesi*, there occurred infections and death, which would not have been expected if the strain reinoculated had been the homologous one. Nevertheless, there was some indication that a partial cross immunity existed between the strains.

From the results outlined above, it is clear that after sterilization of the chronic infections there is persistence of partial immunity up to about one year, as indicated by the recovery of the animals after mild or moderately severe infections. The end-point at which immunity disappears seems to be independent of the length of the chronic infection, though this undoubtedly influences the degree of immunity while it lasts. The experiments detailed in the paper have been carefully carried out, and the course of the infections has been followed by daily blood examinations and parasite counts. In addition, the complement-fixation titres were determined by the method of Coggeshall and Eaton.

The paper is a long one, which is well worth careful study, as it establishes beyond doubt the fact that after complete recovery from a malarial infection an existing immunity may last for as long as one year. *C. M. Wenyon.*

Thompson, P. E. & Huff, C. G. **A Saurian Malarial Parasite, *Plasmodium mexicanum*, n.sp., with both Elongatum- and Gallinaceum-Types of Exoerythrocytic Stages.** *J. Infect. Dis.* 1944, Jan.-Feb., v. 74, No. 1, 48–67, 5 figs. & 2 pls. (1 coloured). [Refs. on pp. 78–9.]

—— & ——. **Saurian Malarial Parasites of the United States and Mexico.** *Ibid.* 68–79, 1 fig. [Numerous refs.]

A study of the North and Central American lizards has resulted in the discovery of a number of malarial parasites, which are the subject of these two papers.

In the first the authors give a detailed description of a new species—*Plasmodium mexicanum* from the lizard *Sceloporus ferrariperezi* from Mexico. Of 61 specimens examined, 23 harboured the parasite. A strain isolated by the inoculation of the collared lizard *Crotaphytus collaris* was inoculated to the common horned lizard *Phrynosoma cornutum*, the Texas shiny lizard *Sceloporus olivaceus* and the common fence lizard *Sceloporus undulatus*. Soon after the infections were established it was noted that a wide variety of cells other than red blood corpuscles were infected. In fact, this was the first instance in which exoerythrocytic stages of a saurian malarial parasite had been noted. There are two types, *viz.*, those described for *P. elongatum* of birds, in which the parasites occur in a great variety of blood and blood-forming cells, and those commonly found in *P. gallinaceum*, which occur in macrophages and true endothelial cells. The proportion of the two types varies with the different hosts. *P. mexicanum* resembles in many respects *P. maculilabre*, described by SCHWETZ in 1931 from *Mabuia maculilabris* in the Belgian Congo. In this form, however, exoerythrocytic forms were not recorded, while it differed in other respects. Thus, it occurred in a lizard of the family Scincidae, while attempts by the author to infect three species of this family with *P. mexicanum*, which occurs in members of the family Iguanidae, have failed.

In the second paper, other saurian parasites are described. A new species *P. rhadinurum* from *Iguana iguana rhinolopha* of Mexico closely resembles *P. minasense* of *Iguana sapidissima* of Trinidad. It differs, however, in that about 24 per cent. of the trophozoites possess one or two long, slender cytoplasmic processes, which may be bifurcate at the end. This feature occurs not only in the original host but also in *Sceloporus undulatus*, which was successfully infected. Another new species is *P. floridense* of *S. undulatus* from Florida. This form resembles *P. tropiduri* of *Tropidurus torquatus* and *P. stenocerci* of *Stenocercus* sp. It was successfully inoculated to *Crotaphytus collaris*, *C. wislizenii* and *Anolis carolinensis*. Of a number of *Aëdes aegypti* and *Culex pipiens* fed on infected lizards, the sole indication of development was the formation of a single oöcyst in an *Aëdes aegypti* fed on a lizard infected with *P. floridense*. About 150 *Aëdes aegypti* and *Culex pipiens* were allowed to feed on *Iguana rhinolopha* and *S. undulatus* infected with *P. rhadinurum*. For some unknown reason the mosquitoes died within 24 hours. *C. pipiens* fed on uninfected *S. undulatus* lived normally. It is suggested that *P. rhadinurum* is lethal to mosquitoes. In addition to the well-defined malarial parasites noted above, other less well-defined pigmented parasites were seen, as also certain unpigmented forms. An organism resembling *Sergentella hominis* described by BRUMPT in 1910, and a similar form seen by HUFF in the blood of a canary in 1939, was met with in the lizard *Phrynosoma cornutum*. In *Anolis carolinensis* numerous unsheathed microfilariae were noted. The two papers are illustrated by two plates, one in colour, and give a list of references to literature dealing with malarial parasites of lizards.

C. M. Wenyon.

TRYPANOSOMIASIS.

VANDERPLANK, F. L. **Identification of Trypanosomes by Chromosomes.** [Correspondence.] *Nature*, 1944, July 1, 19–20.

This is a preliminary note of an investigation into the structure of the nucleus of trypanosomes, limited, so far, to *Trypanosoma rhodesiense* and *T. congolense*; trypanosomes in blood smears and also in the saliva of tsetse flies were used. The author hopes to publish a fuller account later. The findings are best given in an abstract by quoting his own words.

"Mitosis occurs in both species. . . . *T. rhodesiense* has two types of individuals, one homoploid, with two paired and two unpaired chromosomes (N = 6) and the other heteroploid with two paired and one unpaired chromosomes (N = 5). *T. congolense* has also been observed to have two types of individuals, one with three paired chromosomes and the other with three paired and one unpaired chromosomes.

"It appears, although this is not yet confirmed, that meiosis may also take place, the unpaired chromosomes acting like the sex chromosomes of other animals, and that gametes are thrown out by the meiotic trypanosome." *J. F. Corson.*

VAN EMDEN, F. I. **A New Sub-Species of *Glossina* from Uganda (Diptera).** *Bull. Entom. Res.* 1944, July, v. 35, Pt. 2, 193–6, 5 figs.

A new subspecies of *Glossina nigrofusca* is described and named *Glossina nigrofusca hopkinsi*. Its special characters were observed by G. H. E. HOPKINS and T. W. CHORLEY in November 1939, in tsetse caught in the Bwamba area, Toro, Western Uganda, where it was found mixed with *G. fusca congolensis* and *G. fuscipleuris*. Two specimens were sent to the author to check the identification.

Reasons are given for deciding that it is a subspecies of *nigrofusca* and not a race of *fusca*; the description is illustrated by the following drawings: the third antennal segment of the new tsetse and of *nigrofusca*; male terminalia of the former and of *G. fusca congolensis*; the female signum of the new subspecies. A key for identification is also given.

The following localities in Western Uganda are mentioned: the Mutande, Makusakusa and Rumandye rivers; Makoka; Mpulia. Two female specimens, sent from the Ituri region, Stanleyville, Belgian Congo, are in the British Museum. *J. F. Corson.*

DIOS, R. L. & DE SOMMERVILLE, E. T. W. Observaciones realizadas con cepas de *Trypanosoma cruzi* Chagas, 1909 conservadas sobre ratones blancos. [**Observations on Experimental Infections of Mice with *T. cruzi*.**] *Rev. Inst. Bacteriolóģ. "Dr. Carlos G. Malbran."* Buenos Aires. 1943, Dec., v. 12, No. 1, 37–59. English summary.

The authors describe the results of observations on experimental infections of white mice with *Trypanosoma cruzi*. The data are based on work carried out during 18 years, with 2,413 mice, using 29 Argentine strains of the trypanosome, 20 of which were isolated from infected triatomid bugs and nine from human cases. The inoculations were in all

cases intraperitoneal. The author notes a high percentage (28·8) of mice refractory to infection. In positive mice there was no appreciable difference between infections with human strains and those with strains of insect origin. The incubation period varied considerably, from a minimum of 2 days to a maximum of 365 days, but usually it was between 3 and 66 days. The maximum duration of the infection was 636 days for human strains and 481 days for triatomid strains. In most cases trypanosomes were present in moderate numbers. The initial infections were usually slight, but gradually became heavier in the course of 2–3 passages, after which they dropped again to the original level. Such fluctuations in the intensity of the infection may occur repeatedly for some time. In some cases the infection disappears spontaneously, while in others the trypanosomes may reach a high degree of virulence and increase considerably in numbers, causing the death of the host within a few days.

C. A. Hoare.

Mazza, S. & Jörg, M. E. Estudios sobre Triatominae. [**Studies on Triatominae.**] I. *Triatoma bruchi*, nova species argentina de Triatominae (Hemiptera-Reduviidae). II. Sobre *Triatoma oswaldoi*, morfología y variación individual. III. Sobre *Triatoma nigromaculata* (Stål 1872). IV. Sobre una suspecta ninfa de *Triatoma rosenbuschi*. V. Particularidades morfológicas de *Triatoma sordida*. VI. Nuevas localidades para *Triatoma infestans* en la provincia de Buenos Aires. VII. Sobre la iconografia original de *Panstrongylus geniculatus* y *Triatoma dimidiata*. *Universidad Buenos Aires: Misión de Estudios de Patologia Regional Argentina (Jujuy). Publicación No. 67.* 1944, 63 pp., numerous illustrations.

Torrealba, J. F. Informaciones sobre enfermedad de Chagas en al Estado Guárico, Venezuela. [**Chagas's Disease in Guárico State, Venezuela.**] *Gac. Med. de Caracas.* 1944, Feb. 29, v. 51, No. 4, 31–6. [Bibliography.]

The author has carried out the xenodiagnostic test on fourteen suspects in suburban ranches of San Juan de Los Moros, Roscio District, in the State of Guárico. Seven yielded positive results. Of the others one had dacryoadenitis and one polyadenitis, while others lived with those who had reacted positively to the test. Local doctors know little of the disease, or they would record cases more often. There is high infant mortality in the district whence the positive cases came, death being assigned to meningo-encephalitis and cardiac disease. [The last section of the article is a list of the author's papers published since 1922; of these, 22 are concerned with Chagas's disease and 18 with conditions quite unconnected with it, such as schistosomiasis, leprosy, submaxillary tumours and hydatidiform mole. No reason is given for including these as part of an article on Chagas's disease.]

H. Harold Scott.

Arnold, H. L., Jr. & Bell, D. B. **"Kissing Bug Bites."** *Hawaii Med. J.* 1944, Jan.-Feb., v. 3, No. 3, 121–2, 1 fig.

"A 'kissing bug,' Triatoma rubrofasciata (De Geer), occurs in Honolulu.

"Two cases of bites inflicted on humans by this bug are reported.

" The bite produces a clinical syndrome strongly suggestive of cellulitis with lymphangitis are regional lymphadenitis ; areas of the body exposed in sleep (face, arms, hands) are most likely to be affected.

" Shallow incision of the swollen bite-site seems to have a favorable effect on the course of the symptoms.

" The bug's presence in Hawaii constitutes a public health hazard, since it is an important vector of American trypanosomiasis."

LEISHMANIASIS.

COLE, A. C. E. **Kala-Azar in East Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1944, May, v. 37, No. 6, 409–35. [14 refs.]

In an earlier paper [this *Bulletin*, 1942, v. 39, 746] the author, with COSGROVE and ROBINSON, gave an account of experiences with 29 cases of kala azar in the King's African Rifles, which became infected in 1941 in the area north and west of Lake Rudolph near the Omo river, an area in the vicinity of Kapoeta, where sandflies occur in large numbers. In the present paper he gives an extended description of these cases, together with 8 other cases seen in 1941, and 23 in 1942. It appeared that the patients in the two additional groups contracted the infection on or near the Addis-Ababa-Nanyuki road, somewhere in the vicinity of Marsabit. The author was also informed by HEISCH that he had diagnosed cases which indicated a source of infection on the Uaso-Nyero river, which crosses the Isiolo-Marsabit road at Archer's Post.

It was possible to make fairly accurate observations on the incubation period of the disease, as in many cases the date of exposure to infection was known. This was from 2 to 4 months, which indicated an infection in the period March to June, the rainy season in the area concerned, for admissions occurred during the four months June-September. The majority of patients gave a story of fever and malaise, either sudden or gradual in onset. Abdominal pain, either located over the spleen or liver, or diffuse, was the primary complaint in 20 cases. Others complained of pain in the chest, or cough, while diarrhoea or dysentery was common. The fever was characteristically irregular, but periods of apyrexia of more than 24 hours' duration were not observed. In spite of the fever, with a temperature rising at times to 103° or 104°F., in the majority of cases there was a remarkable degree of physical fitness. Extreme enlargement of the spleen was a relatively late sign. Though the patients were not admitted absolutely at the beginning of the illness, in 11 the spleen was not palpable, and in 12 it was enlarged only a finger's breadth. As regards the liver, the enlargement followed that of the spleen ; on admission, 44 patients had no enlargement. Glandular enlargement involving all groups of glands occurred in half the cases. Damage to the kidneys, probably the result of continued fever, was of frequent occurrence. In 40 cases in which the urine was examined, albumin and granular casts were present. Complications included haemorrhage, diarrhoea, bronchitis and pneumonia, pharyngitis, anaemia and oedema.

In differential diagnosis, undulant fever, which is accompanied by long-continued irregular fever, leucopenia and splenic enlargement, is

considered to bear the closest resemblance to kala azar. A feature of many cases was a rash, which appeared on the face, and which extended in some cases to the trunk and arms, and to the lower part of the body. It recommenced as a miliary eruption, which might progress into larger papules. These, in some cases, became transformed into plaques resembling a lichen, or even into warty growths [see also COLE, this *Bulletin*, 1943, v. 40, 229.] Scrapings made from the lesions in 12 cases revealed leishmania in 8. It was noteworthy that the rash was seen only once in 22 fatal cases, and 17 times in 38 patients who recovered. In all cases the rash had disappeared before the patients left hospital.

Of the 60 patients, 22 died, but the death rate of 51 per cent. in the 1941 cases was reduced to 13 per cent. in 1942, owing to the better supply of drugs in the later period. The causes of death, apart from the leishmania infection itself, were dysentery, myocardial failure, pericarditis, pneumonia, typhoidal state, asthenia and anaemia.

As regards the presence of parasites, these are scanty early in the disease, but may become incredibly numerous. They are not invariably commonest in any one organ, and a negative result should be followed by examination of others. From the point of view of convenience and lack of trauma, it is best to begin with gland puncture, and if this is negative to pass on to the spleen or marrow. Liver puncture is probably only of value when this organ is grossly enlarged. Skin scrapings should always be examined if a rash is present. It was found that the formol-gel test was negative in 21 early cases. In late cases, where pyrexia had lasted three or four months, it became positive.

On the subject of treatment, the author stated that the response to tartar emetic was similar to that reported for Sudan cases: it should never be used if other drugs are available. With anthiomaline given intramuscularly, two cases were treated successfully. The drug is useful when intravenous therapy is difficult or impossible. Large dosage is necessary, such as 4 cc., on alternate days, up to a total of 60–80 cc. Urea stibamine proved to be the most valuable drug. The course recommended for normal cases is 14 daily intravenous injections of 0·05, 0·1, 0·15, 0·2, 0·2, 0·2, etc., to a total of 2·5 gm. Nine patients were treated with this course, and none relapsed. Three with a long history, large numbers of parasites, low state and anaemia, died with some exacerbation of symptoms after the 6th or 7th injections. Five patients who had relapsed after urea stibamine (inadequate dosage) diamidino stilbene, tartar emetic and multiple treatments, were successfully treated with an intensive course of urea stibamine. This consisted of 0·1 gm. the first day, 0·2 the second, and 0·3 gm. daily thereafter, the whole course lasting 10 days, giving a total dosage of 2·7 gm. The temperature fell in three to five days, and there was rapid shrinkage of the spleen. No relapse occurred.

With diamidinostilbene [Stilbamidine], 14 cases were treated. The dosage was about 1 to 1·3 gm. in 12 injections spread over 14 to 30 days. Of the 14 cases, 7 were cured: one after a repeated course. Of the 7 not cured, several courses had been tried in some. It is admitted that the dosage may have been inadequate. The reason for this is the relative insolubility of the drug, which requires injections of more than 10 cc. for doses above 100 mgm., and the unpleasant effects, such as tightness in the chest, feeling of fire along the veins, vomiting, great depression and collapse due to a drop in blood pressure. In one case, however, a cure was obtained by an intensive course of 50 mgm., 100 mgm., 150 mgm., and then 200 mgm. daily to a total of 2·5 gm.

In addition to specific therapy, symptomatic treatment is necessary. The most important is blood transfusion, which is particularly necessary in severe secondary anaemia with oedema, epistaxis and other bleedings from the mucosae. Small transfusions of 1 pint are helpful, but continuous drip transfusion is recommended till a figure of 50 per cent. haemoglobin at least is reached. Specific drugs can be added to the drip. At the same time, every opportunity should be taken to improve the wasted condition with meat and a diet rich in vitamins. A cure can fairly safely be assumed if relapse has not occurred within 2½ months of completion of a course which has brought about cessation of fever, improvement in general condition, reduction in the size of the spleen, improvement in the blood picture and disappearance of parasites. *C. M. Wenyon.*

BURKE, E. **Abdominal Pain in the Diagnosis of Early Kala-Azar.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1944, May, v. 37, No. 6, 441–5.

The author, who has had a long experience of kala azar on tea estates in Assam, was struck by a reference to abdominal pain as a symptom of kala azar in a paper by COLE, COSGROVE and ROBINSON, describing an outbreak of the disease in a battalion of the King's African Rifles [this *Bulletin*, 1942, 39, 746]. In his own experience of some 7,000 cases of the disease he has come to regard abdominal pain as, if not a diagnostic sign, at least one which should give rise to suspicion and justify the keeping of a patient under observation for the development of other signs of kala azar. He states that it occurs in 2 or 3 per cent. of all cases. *C. M. Wenyon.*

SHELLIM, M. A. **An Unusual Case of Kala-Azar successfully treated with Stilbamidine.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1944, May, v. 37, No. 6, 447–9.

The case described is that of a corporal in the Greek army who appeared to have contracted the disease in the Greek island of Ikaria. The unusual feature was the fact that the spleen was not palpable, while the liver was enlarged. This gave rise to suspicion of hepatitis, for which emetine was given. During this treatment it was noticed that the temperature showed a double daily rise. Sternal marrow and venous blood were inoculated to Locke's blood agar. In all the tubes cultures of leishmania were obtained. The case was successfully treated with two courses of stilbamidine, each of 2 gm., with an interval of 17 days between the courses. The serum protein analyses were of interest, because of the high globulin-albumin ration after the first course of treatment. *C. M. Wenyon.*

ELMES, B. G. T. & HALL, R. N. **Cutaneous Leishmaniasis in Nigeria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1944, May, v. 37, No. 6, 437–9, 3 figs. on 1 pl.

The authors write that "Nigeria is included in the geographical distribution of cutaneous leishmaniasis by CRAIG and FAUST ('Clinical Parasitology,' 1937, p. 128, Philadelphia, Lea & Febiger) and by MANSON-BAHR ('Manson's Trop. Dis.', 1940, 11th edn., p. 197, London, Cassell & Co.), but for many years there has been considerable

local doubt as to its existence." In the present paper they report ten cases which were seen at Kano during 1943, in all of which *Leishmania tropica* were demonstrated. In all cases the lesions conformed to the text-book description of oriental sore. The authors mention some earlier records, but they doubt whether a diagnosis was established by the discovery of leishmania. [They fail to mention a case reported from Kaduma by the late Dr. Dyce Sharp (this *Bulletin*, 1925, v. 22, 696). In this case the reviewer can vouch for the presence of leishmania in films made from the sore.] *C. M. Wenyon.*

FEVERS OF THE TYPHUS GROUP.

Bol. Oficina Sanitaria Panamericana. 1944, Mar., v. 23, No. 3, 206–9. [English summary, 209.] Las rickettsiasis en la América Latina. [**Rickettsial Diseases in Latin America.**]

" Reports from five members of the Pan American Sanitary Bureau Committee on Typhus, showing the distribution in their respective countries of Rocky Mountain spotted fever and the typhus group, cover 791 cases of the former and 9,625 cases of the latter, occurring in recent years. Brazil has reported 663 cases of spotted fever in the fourteen years 1929–42, occurring in 36 localities of three States (Rio de Janeiro, Minas Gerais, and São Paulo), the heaviest incidence being in 1940–41 (78 and 106 C); the report is admittedly incomplete and covers only the severe forms of the disease; the mortality rate is estimated at as high as 80 to 90 per cent. Statistics for certain periods from 1934 to 1943 in Colombia include 128 C, 123 D in seven localities in two Departments (Cundinamarca and Santander del Sur). With regard to typhus fever (type not specified, except for Cuba, where all cases were the murine type), Brazil reported 4 probable cases in 1941 (São Paulo); Colombia, 882 cases in 1942 and the first quarter of 1943 in 40 municipalities in six Departments (Antioquia, Caldas, Cundinamarca, Boyaca, Nariño, and Valle), with a case fatality rate of 10 to 17·4 per cent. in hospital cases; Cuba 24 C, 5 D 1939–1942, in 10 localities, mostly in the provinces of Habana and Pinar del Rio, all were of the murine type and 3 strains were isolated; Ecuador, 517 C, 81 D, 1940–42 (there have been cases since 1940 in 11 provinces: 3 strains of the epidemic type have been isolated); and Mexico, 8,198 C from 1938–1942, with 750 C in Mexico City in 1942; (mortality rate for the capital estimated at 14 per cent.); cases were reported from 31 States and territories and the Federal District, but principally from the temperate plateau (Mexico, Hildalgo, Puebla, and Tlaxcala); both the murine and epidemic forms have been observed."

Albaladejo, L. Tifus exantematico y otras rickettsiosis exantematicas. [**Typhus and other Rickettsial Diseases.**] Segunda Edición. Opusculos sobre investigación y clinica. 109 pp., 18 figs. 1941. Madrid: Ediciónes Morata.

A general account.

BEVAN, C. de V. **Cultivation of South African Rickettsiae in Developing Chicks and the Preparation of Vaccines from their Membranes.** *South African J. Med. Sci.* 1944, Feb., v. 9, No. 1, 1–20, 19 text figs. & 4 figs. on 1 pl. [18 refs.]

This is a report on experiments carried out as a preliminary to the preparation of egg vaccines. The technical details will be found interesting by those engaged on similar work.

Some of the points brought out in the report are as follows. Rickettsiae in yolk-sac smears show up better if the preparation is cleared by benzene before fixation with methyl alcohol. A modification of the Machiavello method of staining is described. Infected tissues dried and sealed *in vacuo* retain their infectivity after six-months' storage at 0 to 4°C. and can be used during at least that period, thus obviating the need to maintain strains in guineapigs.

South African strains of epidemic, endemic, and tick-borne typhus Rickettsiae were used.

Weak egg vaccine prepared in the way described in the paper from epidemic Rickettsiae gave negligible protection to guineapigs against infection with the same strain; vaccine similarly prepared from endemic Rickettsiae gave partial protection against the homologous strain; and tick-borne rickettsial vaccine gave complete protection against its own strain of infection.

A strain of epidemic Rickettsiae became much more virulent to guineapigs after being passaged 28 times through eggs; the incubation period was shortened to one or two days instead of the usual six to nine, and an intense orchitic reaction was caused. It was found that guineapigs were susceptible to this virulent strain even after having been previously immunized by being vaccinated and then infected with living epidemic Rickettsiae of normal virulence. The febrile reactions were less intense, but did occur.

The immunity conferred by endemic and tick-borne rickettsial vaccines also broke down and failed to protect guineapigs against infection with homologous strains whose virulence had been increased by repeated passages through eggs.

When more concentrated vaccines were used the breakdown of the immunity was prevented to some degree, but in the case of epidemic strains it was found that still greater concentrations would be needed.

The author prefers egg vaccines to those prepared from mammals, especially in the case of the tick-borne Rickettsiae, which do not thrive well on mammals but grow luxuriantly on eggs.

John W. D. Megaw.

NYKA, W. **A Method for Staining the Rickettsiae of Typhus in Histological Sections.** *J. Path. & Bact.* 1944, Apr., v. 56, No. 2, 264.

Hitherto no satisfactory method of staining the rickettsiae of typhus has been described; the following technique has been found to give good results.

" 1. Fix small pieces of tissue in Müller's fluid, Embed in paraffin and cut thin sections, 1–3μ.

2. Stain for 5–10 minutes in 5 per cent. basic fuchsin in 90 per cent. alcohol. (Basic fuchsin, 5 g., 90 per cent. alcohol to 100 ml.) This solution keeps well and sections may be left in it for days without affecting the final preparation.

3. Rinse rapidly in tap water; differentiate in 90 per cent. alcohol for 1–2 minutes.

4. Stain for 1–3 minutes in 1 : 10,000 aqueous methyl violet.
5. Rinse in tap water ; differentiate thoroughly in 1 : 1,500 acetic acid.
6. Dehydrate in absolute alcohol or acetone, clear in xylol and mount in DPX4 mounting medium (Media Manufacturing Centre)."

Cytoplasm and erythrocytes are stained pale yellow or pink, rickettsiae and nuclei are violet ; the Rickettsiae are seen lying scattered among the cells or in clumps inside the cells.

Satisfactory sections have been obtained from mouse lung and from chicken embryo yolk sac ; the results depend on the quality of the fixation of the tissue. *J. F. Corson.*

PSHENICHNOV, A. W. [**Current Problems of Typhus Fever.**] *Trudy Molotovskovo Meditsinskovo Instituta.* [=*Trans. Molotov med. Inst.*] 1942, No. 21, 227–38. [In Russian.]

The Soviet health authorities are determined to do their utmost to eradicate typhus fever throughout the Union. It is realized that this object can be attained only if all the epidemiological factors affecting this disease are known, especially the reservoirs of infection in endemic foci. A critical account is given of some of the views held on this question. One of these is that the infection can be carried by animals other than man and louse. However, all attempts to incriminate various mammals as reservoir hosts have failed, while endemic typhus fever in rats has been shown to be independent of the human disease. It has also been suggested that the virus is retained in clinically symptomless human carriers, but so far there is no evidence to support this view. The author believes that, even if a latent infection occurs in man, it is too slight to be taken up by lice, and is consequently of no epidemiological significance.

There remains the possibility that the virus is preserved in the louse. The observations recorded in the present paper are devoted mainly to the solution of this problem. In the course of these investigations the author used only laboratory-bred lice, which were infected either by feeding on patients or by an improved Weigl's method. The criteria of successful infection were the finding of Rickettsiae in smears of louse guts and the reproduction of the disease in guineapigs.

In the course of these experiments the possibility of hereditary (transembryonic) transmission of the virus in lice, and their infection through cannibalism, were tested. However, in the first case, teased-up larvae and nymphs descended from infected lice failed to infect guineapigs when inoculated into them ; in the second case, healthy lice of one sex when kept together with infected lice of the opposite sex failed to become infected. The author then considers the infection of healthy lice with the remains of infected lice crushed on human skin. Infection was successfully produced under experimental conditions by allowing " clean " lice to feed on immune persons whose skin was smeared with emulsions of infected lice. By this " peroral " method the infection was passaged through successive batches of lice without loss of virulence. Although lice crushed on the human body or clothing provide similar opportunities, it was thought that under natural conditions the infection is spread from louse to louse through the faeces, as suggested by some earlier workers. Since this view is not generally accepted, the author has made a series of investigations with a view to its verification. He has demonstrated (1) that masses of Rickettsiae are present in the droppings of infected lice from the 3rd to the 17th

days after the infecting feed, and (2) that such faeces, when emulsified in saline and smeared on the skin of immune persons, are capable of infecting clean lice perorally when these feed on the contaminated area.

The author is convinced that peroral infection occurs among lice living on heavily infested persons, and that such lice represent the reservoir of human infection during the inter-epidemic period. It is also suggested that the peroral method of infection of lice might be used with advantage for experimental purposes, instead of Weigl's method.

The author holds that typhus fever is transmitted to man through the faeces of lice exclusively, and that infection can take place even in the absence of the insects themselves, provided there is faecal contamination.

This raises the question as to the length of time during which the droppings remain infective in the external medium, *e.g.*, on clothing, etc. Regarding this point opinions also vary. The author's observations, conducted under natural conditions, have shown that the virus dies rapidly (*a*) on the skin (2–24 hours), (*b*) in the incubator at high humidity (3 hours), and (*c*) in dead lice at room temperature (6–72 hours). It remains viable for longer periods in the dry faeces of lice (5–20 days), on the underwear (10 days), and under the finger nails (4 days). However, the most favourable conditions for the survival of the rickettsiae in dead lice and in their droppings are provided at low temperatures: thus in the open, during the winter frosts, they proved to be viable up to four months. These observations are of considerable epidemiological importance, if it is taken into consideration that lice constantly foul the skin and clothing of their human host with their droppings, the latter are easily introduced under the finger nails when the patient scratches himself, and minute particles of the faeces may find their way on to the conjunctiva and other mucous membranes. These facts also throw light on infections occurring among the medical personnel without any evidence of infestation by lice. In this connexion the author insists on personal prophylaxis which would afford protection not only against the lice but also against their excrement. He draws attention to the inadequacy of the usual methods of disinfection, which succeed in delousing the clothing but do not always destroy the Rickettsiae of typhus fever.

As regards the bearing of the above observations on the nature of the endemic focus of typhus fever, the author maintains that the epidemic process is continuous, its apparent extinction being due to failure to recognize certain cases of infection. As the result of incomplete sanitary precautions the Rickettsiae can be preserved in lice and transmitted by them to healthy insects perorally. Finally, in an apparently "extinct" focus the Rickettsiae can be preserved for long periods of time in a passive state, *i.e.* in the faeces and dead bodies of infected lice, deposited in the clothing of patients. They will thus serve as the starting point of a fresh outbreak. *C. A. Hoare.*

AGNEW, A. P. & KYLES, W. B. **Typhus Fever in Great Britain.** *Brit. Med. J.* 1944, July 1, 10–11.

This case of typhus fever occurred in a patient aged 24, who was one of 19 men admitted to hospital on January 5th, 1944, from a ship that had sailed from a typhus-infected area on December 20th, 1943.

All the men had become ill during the voyage, and a number of them, including the patient, had acute respiratory infections attributed to influenza.

The patient was reported to have had fever with cough on December 31st, when the temperature rose to 102°F. By January 2nd, his temperature had fallen to normal, but two days later the temperature rose again to 101·2°F., and bronchitis was diagnosed.

On admission there was severe headache, sore throat, and cough; before being put to bed the patient had a sharp rigor with collapse and a temperature of 103°F. Next day, January 6th, the face was flushed, the conjunctivae were injected, and there was a non-adherent exudate on the throat, but swabs were negative for *C. diphtheriae* and haemolytic streptococci. Slight generalized adenitis and rigidity of the neck were observed. On January 7th there were drowsiness, restlessness, increased rigidity of the neck, more intense bronchitis, and impairment of hearing. [See also this *Bulletin*, 1943, v. 40, 382.] On January 9th, the condition had become worse and a macular rash, consisting of about 20 spots, of 2 to 3 mm. diameter, was detected on the flanks and shoulders. On January 10th the Weil-Felix test was carried out and the titre with *Pr. OX19* was found to be 1–4,000.

From this date the temperature fell gradually and became normal on January 17th.

On January 15th the Weil-Felix titre was 1–12,800, and on February 21st it was 1–6,400.

The onset was assumed to have been on January 4th or 5th, and the earlier symptoms were regarded as being due to a "prodromal state" or to influenza.

No lice were found on the patient or on contacts. None of the other patients developed a positive Weil-Felix reaction, and there were no secondary cases.

In addition to the usual measures of control attendants wore masks to guard against droplet infection, and care was taken in handling the blood and sputum.

Attention is called by the author to the need for recognizing the possibility of typhus fever in unusual cases of this kind.

John W. D. Megaw.

Begg, A. M., Fulton, F. & van den Ende, M. **Inclusion Bodies in association with Typhus Rickettsiae.** *J. Path. & Bact.* 1944, Jan., v. 56, No. 1, 109–13, 13 figs. (10 coloured) on 3 pls.

This paper is illustrated by ten excellent coloured drawings and three photomicrographs taken by ultra-violet light. It deals with the interpretation of the inclusion bodies and other forms of typhus Rickettsiae found in smears from the lungs of rabbits and rats which had been infected by the intranasal route with suspensions of infected mouse lungs.

The observations made by Giroud and Panthier on the same subject are mentioned [this *Bulletin*, 1942, v. 39, 753–754; 1943, v. 40, 764.]

The suspensions used were made from the hepatized lungs of mice in which enormous numbers of discrete *Rickettsia prowazeki* occurred as the result of increased virulence of the infection caused by repeated passages by the intranasal route. Rabbits infected intranasally by the suspensions remained free from illness, but homogeneous rounded

bodies were found in smears from their lungs; these bodies were of various sizes and were stained red by Machiavello's method. After a series of passages through the lungs of rabbits, progressively increasing signs of consolidation appeared, and clusters of Rickettsiae ("morulae") were found in addition to the homogeneous bodies. After further passages discrete Rickettsiae were also found; at first these were large, but gradually they became smaller and much more numerous.

When rats were infected by the intranasal route with mouse-lung Rickettsial suspensions of the murine type, intense consolidation was caused in the first passage; morulae and discrete Rickettsiae were found in the lung smears, but there were no homogeneous bodies.

From these and other experiments the authors conclude that the homogeneous bodies appear only during the period of adaptation of the Rickettsiae to a new host. They leave it an open question whether the bodies are, as suggested by Giroud and Panthier, forms of degeneration, or early stages of morulae. They mention that photographs by ultra-violet light favour the former interpretation.

John W. D. Megaw.

Louw, A. H. **Mercurochrome in Typhus.** [Correspondence.] *South African Med. J.* 1944, June 10, v. 18, No. 11, 204.

Louw suggests that the treatment of typhus with intravenous mercurochrome (2–4 cc. of a 1 per cent. solution daily for six days), together with a high-vitamin diet and vitaminized oils, should be given a trial. In a few cases in his hands this treatment has shown promising signs; it was described by Giunta and d'Ignazio [this *Bulletin*, 1939, v. 36, 989].

Charles Wilcocks.

Moragues, V., Pinkerton, H. & Greiff, D. **Therapeutic Effectiveness of Penicillin in Experimental Murine Typhus Infection in dba Mice.** *J. Exper. Med.* 1944, Apr. 1, v. 79, No. 4, 431–7.

Two of the authors, Pinkerton and Greiff, have already found that penicillin strikingly inhibits the growth of murine Rickettisae in yolk-sac cultures. The report of this finding was under publication at the time of writing.

The present article deals with experiments on dba mice [an inbred strain] in conditions in which the untreated animals die of infection by murine typhus [see this *Bulletin*, 1944, v. 41, pp. 557, 558].

Six lots of mice, each consisting of 10 to 14 animals, were used; half of each lot served as controls.

In two of the lots of mice the dose of infection was such as to cause a rapidly fatal illness in the untreated animals; in these penicillin had little or no effect except that in one of the lots the incubation and survival periods were prolonged by about one day.

In one lot of mice infected with a moderate dose of Rickettsiae which caused the death of the six controls after survival periods of seven to eight days, treatment with penicillin in daily doses of 930 units, given intraperitoneally in divided doses and starting seven hours after infection, completely protected the six treated animals from illness.

In another lot of animals the illness was rather less severe in the seven controls so that one of them survived; in this experiment 640 units of penicillin, given daily and starting 48 hours after the infecting dose, modified the severity of the attacks in the treated mice, five of which survived, one was killed for examination, and the seventh died of post-partum haemorrhage.

In one lot of 12 mice, in which all the six controls died after survival periods of $4\frac{1}{2}$ to $5\frac{3}{4}$ days, there were three survivors among the six animals treated by 1,100 units of penicillin daily, beginning six hours after the infecting dose.

There were two survivors among six mice treated by 830 units daily, starting 24 hours after the infecting doses; all six controls died.

All the deaths among treated and untreated mice were found to have been due to Rickettsial infection; secondary bacterial invasion was completely excluded.

In most of the experiments there was an interval during the night of 12 hours between two of the five to seven divided doses, so that the concentration of the drug was probably not maintained at an effective level throughout the 24 hours.

The authors conclude that it would seem reasonable to expect a beneficial therapeutic effect from penicillin in human cases of typhus; they suggest that the treatment should be started as early as possible and that the doses should be rather larger than those used in bacterial infections. More prolonged treatment would also be probably needed.

[In view of these findings it is likely that penicillin will be tried in the fevers of the typhus group. Intravenous administration would seem to be most suitable because of the special distribution of the Rickettsiae in the walls of the blood vessels.] *John W. D. Megaw.*

GREIFF, D. & PINKERTON, H. **Inhibition of Growth of Typhus Rickettsiae in the Yolk Sac by Penicillin.** *Proc. Soc. Exper. Biol. & Med.* 1944, Feb., v. 55, No. 2, 116–19.

This is an account of the experiments which led up to the trial of penicillin in mice experimentally infected with typhus Rickettsiae as described above.

Eighteen yolk-sac cultures of a murine strain of Rickettsiae were treated by injections of the sodium salt of penicillin into the yolk sacs. The injections were started on the 2nd or 3rd day after inoculation with the infected material. The same number of untreated eggs served as controls. The effect of the drug was estimated by making smears of the yolk-sac membranes, and, after staining the films, counting the number of Rickettsiae seen in each oil-immersion field.

The majority of the control eggs died with heavy rickettsial infection between the 11th and 13th day after inoculation. One died on the 4th day, before multiplication of the organisms had begun; three had 10–100 in each field; two had 100–1,000; five had 1,000–5,000; and seven had 5,000–8,000.

Among the penicillin-treated eggs four died on or before the 6th day, but no recognizable Rickettsiae were seen; nine had less than one in each field; three had 1–10; one had 100–1,000; and one had 1,000–5,000.

Two guineapigs were inoculated with material from two heavily-infected control eggs, and two with material from two penicillin-treated eggs containing less than one Rickettsia in each field ; all four animals developed typical murine typhus, so that the drug was regarded as acting by inhibiting the growth of the organisms, not by destroying them.

It appeared that the inhibition was caused by " penetration of the drug into the cells [of the yolk sacs], and not entirely by its direct action on extracellular organisms in the process of passing from cell to cell." *John W. D. Megaw.*

BULL. U. S. ARMY MED. DEPT. 1944, May, No. 76, 52–61, 8 figs.

Scrub Typhus.

Because of the practical importance of mite-borne typhus to troops operating in the South Pacific area, a team of American investigators went to New Guinea in September 1943 to study the disease ; all, except the Field Entomologist, returned home about the end of December. They brought back strains of *Rickettsia orientalis*, which are being studied at the Army Medical School, the Naval Medical Research Institute, and the National Institute of Health, with a view to preparing a vaccine if this should be possible.

The organism is easily isolated during the early stages of the disease as follows : a small portion of blood-clot is ground up with normal saline and centrifuged at low speed ; 0·3 cc. of the supernatant fluid is inoculated intraperitoneally into mice and this is followed by their death 10–16 days afterwards ; smears from the peritoneum, stained with Giemsa's stain, show Rickettsiae.

The larval form of the mite feeds on the rat or bandicoot in New Guinea, and man is only an accidental host ; the species of mite which transmits the disease cannot yet be definitely stated, but, apparently, it is not the itch mite, since little, if any, correlation was found between the incidence of " scrub itch " and the frequency of infection with scrub typhus, each being found in the absence of the other.

Little is known of animal reservoirs of the disease ; rats and bandicoots were numerous and harboured mites, and these were also found on lizards and birds. No seasonal incidence was observed ; the risk of infection appeared to be greatest at the border between the kunai grass and the jungle.

The incubation period is about 10–18 days. The onset is sudden, with headache and fever which rises slowly during the first week, remains steady during the second and subsides by lysis during the third. The headache becomes quite severe. An eruption of dull-red macules appears on the 5th to 8th day. The lymph nodes enlarge. The primary lesion is an ulcer covered with a black scab. The agglutination test with *Proteus OXK* confirms the diagnosis but Rickettsiae have been isolated from the blood in patients whose sera gave a negative agglutination test.

With regard to treatment, it is stated that " penicillin employed in maximum dosage had no effect on the course of the disease " [see MORAGUES, PINKERTON and GREIFF above]. As hypochloraemia frequently develops, common salt should be given, 6–8 gm. daily.

Preventive measures at a camp site consist of cutting and burning the long kunai grass, followed by burning over the site with a powerful

oil sprayer. Personal prophylaxis includes sleeping above the floor level and taking a bath as soon as possible after exposure to infection.

J. F. Corson.

PLOTZ, H., REAGAN, R. L. & WERTMAN, K. **Differentiation between Boutonneuse and Rocky Mountain Spotted Fever by means of Complement Fixation.** *Proc. Soc. Exper. Biol. & Med.* 1944, Mar., v. 55, No. 3, 173–6.

In this paper a complement-fixation test is described by which the related diseases, Rocky Mountain spotted fever (hereafter referred to as R.M.S.F.) and boutonneuse fever (B.F.) can be differentiated from each other.

The antigenic relationship between the two diseases had been demonstrated by BADGER, who in 1933 found that a cross-immunity occurred in guineapigs [this *Bulletin*, 1933, v. 30, 895]; but DAVIS and PARKER in 1934 found that a vaccine which protected guineapigs against R.M.S.F. did not protect them against B.F. [this *Bulletin*, 1934, v. 31, 633].

The R.M.S.F. antigens used in the present tests were made from Rickettsiae grown in tissue cultures on agar, the B.F. antigens were prepared from yolk-sac cultures by the method already used by PLOTZ in connexion with corresponding tests for differentiating between epidemic and endemic typhus [this *Bulletin*, 1943, v. 40, 443.]

In preparing the antigens—by inactivating the Rickettsiae with 5 per cent. formalin, centrifuging and washing four times in saline—it was found that the supernatant fluid in each case contained a soluble antigen, and that when this was used in carrying out the test the B.F. antigen gave the same positive response with R.M.S.F. serum as it did with B.F. serum.

A corresponding degree of cross fixation also occurs between epidemic and murine typhus in guineapigs when soluble antigens are used.

With the insoluble antigens obtained from washed Rickettsiae the results were quite different; the sera of six guineapigs convalescent from B.F. reacted with the homologous antigen at titres ranging from 1–20 to 1–160, but gave negative responses with R.M.S.F. antigen.

So also three lots of pooled sera of guineapigs convalescent from R.M.S.F. reacted at titres of 1–80; 1–80; and 1–160; with the homologous antigen and gave negative responses with B.F. antigen.

Both of the above groups of sera gave negative reactions with corresponding types of antigens made from epidemic and murine typhus Rickettsiae.

Tests of sera from persons who had recovered from B.F. and R.M.S.F., made in the same way with washed antigens, gave the following results: (*a*) Five persons whose previous attacks of B.F. dated from the number of years previously that are shown in brackets, reacted respectively with B.F. antigen 1–320 (1 year); 1–40 (2 years); 1–40 (5 years); 1–80 (6 years); and 1–20 (10 years). The corresponding titres of these sera with R.M.S.F. antigen were 1–20; 0; 0; 1–10; and 0.

(*b*) Ten persons, tested 14 to 217 days after the onset of R.M.S.F. reacted with the homologous antigen at titres of 1–80 to 1–1,280; with B.F. antigen four of them were completely negative, the titres in the other six cases were 1–10 to 1–160, and in each individual case the titre was considerably lower than with R.M.S.F. antigen.

The washed purified antigen can therefore be used to differentiate between boutonneuse fever and Rocky Mountain spotted fever, although there is some degree of cross fixation which shows that the two diseases are antigenetically related to each other.

It is stated that other members of the spotted fever group are being studied in the same way. *John W. D. Megaw.*

MAGALHAES, O. Rickettsiasis no Brasil. [**Rickettsial Diseases in Brazil**]. *Bol. Oficina Sanitaria Panamericana.* 1944, Jan., v. 23, No. 1, 17–19. English summary.

" This article covers a summary of papers published in various Brazilian journals and also information furnished to the Pan American Typhus Committee. Most of the information is for the State of Minas Gerais, Brazil. Apparently Rocky Mountain spotted fever has existed in Brazil for quite some time. Various localities in the States of Minas Gerais, São Paulo and Rio de Janeiro are affected and the author believes that the disease may also be found in the States of Goiás, Espírito Santo and Bahia. There are four clinical forms of the disease : inapparent, mild, malignant and fulminating. It seems that there is only one virus but it is probable that there are various strains which may be differentiated by proper tests. The epidemiological nature of the infection in some regions of Minas Gerais is quite different from that of Rocky Mountain spotted fever in the United States. The principal field and mountain vectors are *Amblyomma cajennensis* and *A. brasiliensis*. The common bed-bug (*C. lectularius*) was found in some cases infected in nature. From 1929 to 1942 the States of Rio de Janeiro, Minas Gerais and São Paulo have reported many serious cases as shown in the accompanying table.

" The presence of epidemic exanthematic typhus was first suspected in Brazil by Lemos-Monteiro and Fonseca-Prado in 1932. In 1941 Sales Gomes reported four " probable " cases of murine typhus in the Capital of the State of São Paulo."

Year	States			
	Rio de Janeiro	Minas Gerais	São Paulo	
			Capital	Interior
1929 ...	...	7	15	...
1930 ...	...	...	21	4
1931 ...	...	2	28	9
1932 ...	...	4	15	4
1933 ...	...	20	26	3
1934 ...	...	22	20	6
1935 ...	...	23	22	7
1936 ...	...	34	12	2
1937 ...	...	27	11	2
1938 ...	...	22	16	6
1939 ...	...	15	25	14
1940 ...	1	18	31	28
1941 ...	20	24	19	43
1942 ...	9	9	15	2

Bustamante, M. E. & Varela, G. Aislamiento de una cepa de fiebre manchada idéntica a la de las Montañas Rocosas en Sinaloa, México. [**Isolations, in Sinaloa, of a Strain of Spotted Fever Rickettsiae Identical with that of Rocky Mountain Fever.**] *Bol. Oficina Sanitaria Panamericana.* 1944, Feb., v. 23, No. 2, 117–18. English summary.

A more complete account of this work was reviewed in this *Bulletin*, 1944, v. 41, p. 394.

DENGUE.

Carson, D. A. **Observations on Dengue.** *U.S. Nav. Med. Bull.* 1944, May, v. 42, No. 5, 1081–4.

These observations relate to an epidemic of dengue in an island in the South Pacific area.

The author suggests that in addition to the known vectors, *Aëdes aegypti* and *Aëdes albopictus*, another species of mosquito may be concerned in transmission, *viz.*, *Aëdes albopictus* var. *hebrideus* which breeds in holes in tree trunks and therefore needs special methods of control.

Infection in the area was spread from island to island chiefly by aviation personnel, and control was at first inadequate because of failure to recognize the fact that *Aëdes* mosquitoes bite by day as well as by night and because of laxity in applying mosquito-control measures.

Some of the special clinical features were :—

Pain referred to the eyes and aggravated by movements of the eyeballs was the most characteristic symptom. "Break-bone pains" and initial chills were seldom observed. A saddle-back type of fever curve occurred in 77 per cent. of the cases. [The author applies this term to all the cases in which there was an obvious tendency to a two-phase type of curve.]. A third febrile peak was seldom seen ; when it did occur it was considerably lower than the preceding ones. The temperature usually became normal by the 6th day. Enlargement of the lymph glands, especially those of the cervical region, occurred in 34 per cent. of the cases. Pronounced leucopenia was observed in all the severe cases, but in mild attacks the white-cell count was sometimes normal.

There was a maculo-papular rash on the trunk and extremities in 42 per cent. of the cases ; this made its appearance at any stage of the fever after the first day.

The patients became fit for duty by the 10th to the 14th day.

The use of the therapeutic test by quinine or atabrine [mepacrine] is condemned till every other diagnostic measure has been tried.

John W. D. Megaw.

Public Health Rep. Wash. 1943, Dec. 10, v. 58, No. 50, 1823–5. **Dengue Fever in Honolulu.**

In Honolulu dengue broke out in July 1943, and by December 4th a total of 1,250 cases had been reported, the peak of the outbreak having occurred in October. There was great variation in severity,

from very mild ambulatory to extremely severe bedridden cases, with delirium and mental disturbances; one death is reported. Previous outbreaks were recorded in 1903 and 1912, and 10 years ago there occurred, in the natives, a similar fever, then not diagnosed as dengue.

Charles Wilcocks.

USINGER, R. L. **Entomological Phases of the Recent Dengue Epidemic in Honolulu.** *Pub. Health Rep.* Wash. 1944, Mar. 31, v. 59, No. 13, 423–30. [12 refs.]

Some of the interesting points contained in this paper are as follows:—

There were no mosquitoes in Hawaii till 1826 when *Culex quinquefasciatus* [*C. fatigans*] arrived in a ship from Mexico. *Aëdes aegypti* and *Aëdes albopictus* were introduced somewhat later. No other mosquitoes have been found, so that the islands, like all the other oceanic islands of Polynesia and Micronesia, except the New Hebrides, are still free from indigenous malaria.

The introduction of anophelines into the New Hebrides fully justifies the efforts made to exclude the entry of mosquitoes into Hawaii. The spraying of all incoming planes is strictly carried out.

Dengue was first introduced into Honolulu in 1902 from Hong Kong by a steamship which arrived with 12 cases of the disease on board; the ship had sailed from Hong Kong 25 days earlier. About 50,000 cases occurred in the islands.

In October 1911 a steamship arrived from Mexico with cases of yellow fever among the personnel, and a local watchman who went on board was attacked. Prompt and drastic preventive measures were taken, including the eradication of banana plants to the value of $50,000, and no further cases occurred.

In 1912 a second epidemic of dengue occurred in Honolulu, and a few cases were reported in the three succeeding years.

In July 1943 the disease again made its appearance; it was probably introduced by the personnel of a commercial aeroplane. In spite of preventive measures, or more probably because of negligence by a large laundry establishment in carrying them out, the infection became widespread in Honolulu, and at one time 100 cases were being reported weekly.

The distribution, characters and habits of the three indigenous mosquitoes are described, and it is mentioned that *Aëdes scutellaris* and *Aëdes albopictus* have been included by some observers under the name *Aëdes aegypti*.

At present 85 per cent. of the *Aëdes* mosquitoes of Honolulu are *albopictus* and only 15 per cent. are *aegypti*. Their habits are similar in most respects; both are urban breeders, and bite by day and not at night, but *albopictus* breeds also in water in tree holes and at the bases of plant leaves, so that its control in forest areas is impracticable. It breeds also at higher levels—up to 2,000 feet—than *aegypti*.

Aëdes control in Hawaii comprises routine inspection and attention to all premises every ten days; when epidemics occur adult mosquitoes are sprayed, so are the inside and outside of all premises in and round foci of infection.

Foliage is sprayed with a pyrethrum and oil spray, three parts in 100 of water, with "Vatsol" as an emulsifier.

The breeding index in Honolulu in September 1943 was 83 per cent. in a district with high rainfall, and less than 4 per cent. in a dry area:

but, curiously, the cases of dengue were far more numerous in the dry area. The high density of population in the latter locality favoured transmission by mosquitoes with a short flight range, and "the dilution factor in mosquito bites when people are few and mosquitoes are present by the thousands" was regarded as being a hindrance to transmission in the thinly populated area where the index was high.

Successful control is anticipated through prompt reporting of new cases, the isolation of patients, and spraying of local foci. The alternative is the painful and costly process of allowing a temporary immunity to develop as the result of unrestricted spread of the disease.

John W. D. Megaw.

YELLOW FEVER.

Brazzaville [Afrique Française Libre]: Rapport sur le Fonctionnement Technique de l'Institut Pasteur en 1942 [Ceccaldi, J., Director]. 43–8. Fièvre jaune. [**Yellow Fever.**]

Serum protection tests have been continued during the year; 7 out of 49 natives gave a positive reaction. The sera of a few animals were also tested; 3 horses, 5 cows, a goat, 2 gorillas and one agile mangabey gave negative results, while a chimpanzee showed a titre of 640 mouse units. This is thought to be due to non-specific virucidal substances in the serum.

During the year 419 persons were vaccinated against yellow fever with vaccine supplied in 1941 by the Rockefeller Foundation; 301 were Europeans and 118 natives. No reactions were observed.

Protection tests were made of the sera of 38 persons who had been vaccinated in 1941; blood was taken in 24 of them 50–53 days after vaccination, in the remaining 14 after 7 to 14 months. Most of the sera were kept at 6°C. in the refrigerator for about one year before being tested. Five suspensions of virus, corresponding to 64, 640, 1,280, 1,840 and 18,400 mouse protective units per cc. respectively, were used for each serum. The 24 men whose sera were taken 50 to 53 days after vaccination were officers, aged 18 to 28 years, and apparently in good health. The details are shown in a table; two sera had a titre of 18,400; three of 1,840, four of 1,280, and seven of 640 units. Taking a titre of 640 as the minimum for protection, only 16 of the 24 could be regarded as immune. Of the other 14 persons tested after longer periods, one (after 9 months) had a titre of 18,400 and in six others it was 640; *i.e.* only 7 were immune.

Four of the vaccinated persons were tested twice, first after 50 to 53 days and again after a further interval of about one year. In one the titre fell from 18,400 to 64, in another from 1,280 to 640, in the third from 640 to 64, while in the fourth it was 640 in both tests.

The vaccine was a tissue culture vaccine, dried *in vacuo*, and was sent in ampoules each containing 100 doses. The batches were numbered 129, 135, 136, 137, 138, 145, 206 and 209; of these, numbers 206, 129 and 135 were used to vaccinate the 38 persons whose sera was tested afterwards. The emulsion was made by dissolving the contents of one ampoule in 55 cc. of 0·9 per cent. sodium chloride solution (previously sterilized and kept in the refrigerator till wanted). From

the moment of preparation to the end of each vaccination sitting, which did not exceed 20 minutes, the emulsion was surrounded by crushed ice. Each person received 0·5 cc. subcutaneously. The vitality of the batches of vaccine was tested by inoculating white mice; at the end of 1943, after 22 months' storage at about 6°C. in the refrigerator, it was found to be still active ("nettement conservée").

J. F. Corson.

(For the remainder of this Report, see below, p. 873).

PLAGUE.

Jawetz, E. & Meyer, K. F. **Experimental Infection of the Chick Embryo with Virulent and Avirulent** *Pasteurella pestis*. *Amer. J. Path.* 1944, May, v. 20, No. 3, 457–69, 9 figs. on 1 pl. [10 refs.]

Avirulent living plague organisms are now in use as prophylactic vaccines on a fairly large scale. This has stimulated enquiry into the cause and mode of development of loss of virulence. It is to be noted, however, that loss of virulence is to some extent selective for the species of test animal used. Possession of an envelope has apparently been ruled out as the cause of difference between virulent and avirulent plague organisms, and investigation into the antigenic constitution of the two types has not solved the problem. Serological tests fail to establish any fundamental difference between virulent and avirulent plague. Finally it would seem "that the most striking characteristic of virulent organisms is their inability to proliferate freely even in susceptible experimental animals." The susceptible test animal used in the present work was the chick; not the hatched chick, however, which is evidently highly "resistant to both intoxication and infection with *Pasteurella pestis*," but the embryo chick of 12 to 14 days' incubation. The method of procedure was to inoculate definite doses of virulent or avirulent organisms on to the chorio-allantoic membrane, note the lethal effect, the distribution of the organisms in the body of the chick embryo and examine the membrane and organs histologically. Some of the main conclusions of the authors are that:—

1. Chick embryos of 12 to 14 days are very highly susceptible to infection with *P. pestis* and are killed in 4 to 8 days by a dose of 20 virulent or 200,000 avirulent organisms.

2. Avirulent organisms, if the dose is small and not lethal, persist even for 3 to 4 days after hatching, but in spite of their distribution by the blood stream exhibit this distinguishing feature; they fail to multiply freely in the organs and are thus sharply distinguished from virulent organisms.

3. The difference in susceptibility exhibited by 12 to 14-day chick embryos is attributed to absence of a cellular defence mechanism; the failure of hyperimmune antiserum to protect "is taken to indicate that a cellular defence mechanism must be present for antiserum to exert its protective action."

W. F. Harvey.

WAYSON, N. E. & MCMAHON, Margaret C. **Plague Sulfadiazine Treatment of Guineapigs infected by Artificial Methods or by Flea Transmission.** *Pub. Health Rep.* Wash. 1944, Mar. 24, v. 59, No. 12, 385–401, 6 figs. [13 refs.]

These guineapig experiments were designed to reproduce the type and conditions of the disease in man. Sulphadiazine is excreted more slowly than other sulphonamides and was the drug selected. Twenty-six animals were used for treatment as against 24 comparable untreated controls and the treatment was begun " after a papule had developed at the site of inoculation or flea bite with a rise of temperature to 39°C. and an unmistakable bubo had developed in one or two contiguous lymph nodes." A satisfactory blood concentration of the drug was attained by an initial dose of 100 mgm. sodium sulphadiazine subcutaneously and 100 mgm. orally. This was followed by 100 mgm. capsules by mouth for as long as seemed necessary in the test animal. Figures 1 to 3 give the results graphically of the animals inoculated intracutaneously with 1,500 to 25,000 *P. pestis* and figures 4 to 6 the results for guineapigs bitten by infected fleas. Thirteen of the 15 intracutaneously infected guineapigs recovered after treatment, one died accidentally and one with sulphonamide crystals in the kidney. Eleven of the flea-infected guineapigs developed the disease and seven recovered after treatment, showing no infection at necropsy 21 days after inoculation. Practically all the controls died. Sulphadiazine may, therefore, " be of great value in the therapy of bubonic plague in man previous to the development of a generalized bacteremia."

W. F. Harvey.

CHOLERA.

GALLUT, J. & BRUMPT, L. C. Application expérimentale de l'hémoagglutination rapide du vibrion cholérique. [**Experimental Rapid Agglutination of the Cholera Vibrio.**] *Ann. Inst. Pasteur.* 1944, Jan.-Feb., v. 70, No. 1–2, 62–4.

Haemoagglutination differs from the ordinary serum agglutination because the whole blood is used in test; the antigen organisms are previously killed and stained. A reaction is obtained that can be read macroscopically in four minutes at room temperature. Suspensions in saline solution are prepared from the Inaba S type vibrio, are kept for 48 hours at room temperature and shaken two or three times a day. The suspension is then centrifuged at high speed and the deposit suspended in 10 per cent. sodium citrate. It is suitably diluted, receives 1 drop of 1 per cent. methylene blue per cubic centimetre, and is filtered through cotton wool to give a homogeneous suspension. Rabbits were used as experimental animals and immunized sometimes subcutaneously, sometimes intravenously, either with OH antigen (vaccine heated at 56°C.) or exclusively with O antigen (either vibrios heated two hours at 100°C. or glucolipidic antigen), given in two doses at five days' interval. The animals were kept under observation for three months and then tested by intravenous injection of three lethal doses of living vibrios. It was found that O and OH haemagglutination occurred in a few minutes at room temperature while controls were

entirely negative. Intravenous immunization is much superior to subcutaneous. A noteworthy feature of the experimentation was the rapidity of occurrence, intensity and persistence of the agglutinins with glucolipidic antigen. This antigen gives toxic reaction intravenously in human beings and does not give positive haemagglutination subcutaneously for either O or OH antigen, but should be tried as a diagnostic method. *W. F. Harvey.*

HUANG, J. **Treatment of Asiatic Cholera with Sulfaguanidine. Clinical Study of Twenty-Two Cases.** *J. Amer. Med. Ass.* 1944, May 6, v. 125, No. 1, 23–4.

As a result of this treatment of cholera by sulphaguanidine the author became convinced that an " effective remedy " has been found whereby the " bitter enemy, cholera " can be subdued. This conviction is expressed in the concluding sentence : " I fancy that the combined application of sulfaguanidine and salt solution injection will reduce the mortality to less than 5 per cent." In the discussion of his subject he takes fully into account the small number of his cases and the mortality of cholera under other methods of treatment. Improvement in these typical cases of cholera seems to have been dramatic. " Of the 22 patients 21 were cured in a short time and 1 died within seventy-three hours of being ill."

The following account may be taken as example of the mode of treatment : " In 19 adults 3 gm. was given as a first dose and 1 gm. every two hours for six times ; then 1 gm. every four hours for one to two days . . . . The patients were ordered to drink as much water as possible, and circulatory stimulants, such as camphor water and tincture of digitalis, were repeatedly given either by subcutaneous injection or by mouth. But no other drugs were given during the whole treatment."

W. F. Harvey.

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS.

BELTRÁN, E. El problema de la amibiasis en la República Mexicana. [**Amoebiasis in Mexico.**] *Rev. Med. Trop. y Parasit.* Habana. 1944, Mar.-Apr., v. 10, No. 2, 40–41, 1 fig. [11 refs.]

" This paper presents the incidence of *Endamoeba histolytica* in Mexico, and discusses the relative value of the different reports used. Taking those worth considering and applying to them Andrews' correction factor, when necessary, the frequency of *E. histolytica* is as follows : (*a*) Mexico City, children attending at day time school in good sanitary conditions, 7 per cent. ; (*b*) boarding school children, living in defective sanitary surroundings, 47 per cent. ; (*c*) Cuautla, Mor., 41 per cent. ; (*d*) Fresnillo, Zac., 17 per cent. ; (*e*) Tetelcingo, Mor., 52 per cent. ; (*f*) Chamilpa, Mor., 40 per cent. ; (*g*) Tepoztlán, Mor., 29 per cent. ; (*h*) Tehuantepec, Oax., 45 per cent. ; (*i*) Huixtla, Chis., 25 per cent. and (*j*) Estado de Yucatán, 40 per cent."

DRUCKMANN, A. & SCHORR, S. **Amebiasis and its Roentgenological Manifestations.** *Harefuah.* Jerusalem. 1944, May 15, v. 26, No. 10. [In Hebrew 183–5, 5 figs. (16 refs.). English summary 185–6.]

" X-ray studies are very helpful to the clinician in establishing the diagnosis of amebiasis of the colon, liver and lungs.

Amebiasis of the Colon.

" *a.* The *localized type*: Here X-ray examination, particularly if the barium enema is used, yields characteristic roentgenological findings. The ' amebic granuloma ' together with the tissue reaction, edema and swelling of the bowel wall may cause a partial obstruction such as is found in the case of carcinoma of the colon.

" Distinction between stenosis due to a malignant tumour or amebic granuloma is based upon the following points:

" 1. The amebic stenosis is usually longer than the stenosis due to carcinoma.

" 2. In amebiasis several areas of stenosis may be present simultaneously, in carcinoma this occurs very rarely.

" 3. In amebiasis the narrowing of the lumen is usually not so complete as in the case of malignant stenosis.

" 4. In amebiasis the transition from the pathological to the normal portions, in the majority of cases, occurs gradually while in carcinoma this transition is abrupt.

" 5. In amebiasis of the colon the mucous relief is to a lesser degree changed than in carcinoma of the colon.

" *b.* The *diffuse type* presents no characteristic X-ray appearance and it is rather difficult to separate it from idiopathic or ulcerative colitis. The X-ray shows areas of constriction, lack of normal haustration, irregular narrowing of the lumen, with an unusual degree of incompetence of the ileocecal valve.

Amebiasis of the Liver with Pulmonary Involvement.

" When dealing with lung pathology (pleurisy, empyema, basal pneumonia, abscess of the lung) the possibility of pulmonary amebiasis should always be borne in mind, particularly in countries with endemic occurrence of amebiasis, including Palestine too. Among the complications outside the intestinal tract, amebic hepatitis with pulmonary involvement is by far the most common.

" In various stages of the disease, the X-ray appearance is characteristic and in an untreated case the development of the various stages may easily be followed up. *First stage*: amebic hepatitis without involvement of lungs. The roentgenological symptoms consist in elevation of the right diaphragm due to swelling of the liver, restriction of motion of the right diaphragm. *Second stage*: diaphragmatic pleurisy: The right diaphragm is hazy with clouding of the right costo-diaphragmatic sinus. *Third stage*: penetration into the lower part of the right lung—clouding of the base of the right lung, sometimes showing band-shaped shadows. *Fourth stage*: the pulmonary patches of infiltration are confluent creating an X-ray appearance similar to that of pneumonia of the lower right lung field. *Fifth stage*: amebic pulmonary abscess—a stage which is occasionally reached, presenting, on X-ray examination, a cavity with a fluid level.

" In each of these stages specific anti-amebic treatment may restore normal conditions.

Abscess of the Liver.

" Here we find characteristic changes of the contours of the diphragm —distinct bulging of the diaphragm pointing upward into the lower lung field. The diaphragm is elevated and immobilized."

PIRZADA, M. A. **Amoebiasis with special reference to Common Secondary Manifestations in the Punjab.** *Indian Med. Gaz.* 1944, Feb., v. 79, No. 2, 61–6.

Employing the now familiar arguments for and against the universal pathogenicity of *Entamoeba histolytica*, the author here presents a detailed account of seven cases of secondary amoebiasis with problems of diagnostic importance.

The classical type of amoebic hepatitis with enlarged liver is not difficult to recognize, but latent and subclinical hepatitis with pleural and pulmonary lesions are readily missed ; of these hepato-pulmonary amoebiasis, in which inflammation spreads directly from liver to lung tissue, constitutes the commonest type of lung lesion.

Fever was present in all, either remittent or irregularly intermittent in type. Rigors were not recorded, but marked upward or downward liver enlargement was noted in two ; pain in the right hypochondrium in three. Tenderness on liver pressure was the most constant sign, but shoulder pain was absent.

On the other hand, intestinal signs and symptoms were insignificant, although a history of diarrhoea or dysentery was obtained. Thickening of the colon could be elicited in two, though caecal tenderness was more constant. Faecal examinations were distinctly disappointing and *E. histolytica* cysts were demonstrated only in one—a fact which invokes comment from the clinical aspect. Typical chocolate-coloured pus was recovered from the pleura in two cases. In the three lung abscesses, sputum was mucopurulent with varying quantities of blood. No *E. histolytica* were found in the pleural exudate or in pulmonary discharges. A moderate leucocytosis (11,000–20,000 per cmm.) was present in all except one pleural effusion complicating amoebic hepatitis. In one case only (of empyema) were the polymorphs above 80 per cent. Eosinophilia was not present in any case. *P. Manson-Bahr.*

DEL SEL, M. Hepatitis amibiana en sus formas atipicas. [**Clinically Atypical Forms of Amoebic Hepatitis.**] *Rev. Asoc. Med. Argentina.* 1944, Apr. 30, v. 58, No. 532, 217–19.

As a warning to medical practitioners to be on the alert for unusual manifestations of hepatic amoebiasis the author relates the histories of five patients in whose cases the symptoms were unusual and diagnosis uncertain, but who rapidly recovered when suspicion of amoebiasis arose and emetine was given.

The first was a man of 23 years. He had, so he said, never had any intestinal upset, but for a week had felt pain in the lower part of the right side of the chest, with marked fever of a remittent type, severe headache and some vomiting. The spleen was not palpable but on percussion was found to be enlarged. Typhoid or paratyphoid fever was suspected, but the Widal test was negative, the leucocytes numbered 25,000 per cmm., and rash did not appear. Emetine was given and the

first dose was followed by a further rise in temperature, though the patient felt generally better. The drug was persisted with and recovery was rapid.

The second patient was a lad of 17 years, whose history was that he had had much abdominal pain after having eaten a large quantity of figs. Diagnoses varied for a few days between retrocaecal appendicitis and perinephric abscess; purgatives did not benefit. The liver was a little enlarged and emetine was given with excellent results.

The third was a man of 68 years who suffered from constipation, said he had never had diarrhoea, but had suffered for a month from pain in the right hypochondrium and flank, with bilious vomiting, sweating, an intermittent fever and weakness, with loss of appetite. The liver was slightly enlarged. Cholecystitis and biliary cirrhosis were the diagnoses. *Entamoeba coli* was seen in the faeces, but neither *E. histolytica* nor its cysts; nevertheless, emetine was given with good effect, as in the preceding cases.

The fourth was a man of 39 years, thin, pale, with a pulse 110, generally debilitated, with praecordial pain and a friction sound there, a liver enlarged to three fingers'-breadths below the costal margin, with considerable pain. Diagnosis of enlarged liver from back-pressure due to failing heart secondary to pericarditis was made. After a large dose of sodium salicylate, 8 gm. in the day, the signs of pericarditis disappeared. Hydatid cyst was then suspected, or commencing liver abscess, and emetine was given; the symptoms cleared up.

The last case was in a man of 60 years, complaining of pain in the right hypochondrium, not marked; in fact, he thought little of it. He had no vomiting, no diarrhoea, dyspnoea or cough. He was kept in hospital because he had rise of temperature, and pleurisy with effusion was suspected and a little yellow fluid was drawn off. He then felt some pain over the liver and there was slight oedema of the chest wall; the pulse rate was 130 per minute. Blood examination gave red cells 3,500,000, white 11,000 per cmm., with slight relative polynucleosis. Diagnosis of some subdiaphragmatic condition was made, with subjacent pleural reaction. Emetine was given in doses of 6 cgm. daily subcutaneously. The temperature fell to normal, the pleural signs rapidly disappeared and progress to health was uneventful.

H. Harold Scott.

KATSAMPES, C. P., McCOORD, Augusta B. & PHILLIPS, W. A. **Vitamin A Absorption Test in Cases of Giardiasis.** *Amer. J. Dis. Children.* 1944, Mar., v. 67, No. 3, 189–93, 6 charts.

VÉGHELYI [this *Bulletin*, 1940, v. 37, 375] and others have described the varied and vague clinical symptoms associated with the presence of *Giardia intestinalis* in the upper part of the small intestine of children. In addition Véghelyi has concluded that because of the increased amounts of fat and lipase in the stools of such children the flagellates had impaired the absorption of fat from the intestine. The fact that after eradication of the infection by means of quinacrine [mepacrine] hydrochloride the stools became normal, appeared to indicate that removal of the parasite had restored the normal power of the intestinal mucosa to absorb lipids. With a view to throwing further light on the question the authors of the paper under review applied the vitamin A absorption test of CHESNEY and McCOORD [see *Bulletin of Hygiene*, 1936, v. 11, 264] to a number of cases before and after

treatment. In all of 15 cases absorption of vitamin A, after administration by mouth of 7,000 U.S.P. units of vitamin A in fish liver oil per kilogram of body-weight, was less than in normal children in whom the blood concentration increases to a maximum of 225 units four hours after the dose has been taken. Thereafter there is a gradual fall to the basal level during 20 hours. In infected children the concentration at the end of four hours varied from 8 to 139 units. After treatment, in nearly all cases, there was improved absorption and in some it was even better than normal. In one case the absorption remained poor and this proved to be a case which suffered relapse. As a control, three cases with symptoms of coeliac disease, in which vitamin A absorption is also defective, administration of a course of quinacrine hydrochloride failed to produce any improvement. It is concluded that these results afford further evidence of the pathogenicity of *Giardia intestinalis*. *C. M. Wenyon.*

RELAPSING FEVER.

ORDMAN, D. **Epidemiological Observations on an Outbreak of Tick Relapsing Fever in the Northern Transvaal.** *South African Med. J.* 1943, June 12, v. 17, No. 11, 180–82.

The present study was carried out in December 1941 on the occurrence of relapsing fever in a community of about 2,000 native labourers employed on a large agricultural estate in the Potgietersrust district of Northern Transvaal.

The natives were housed in a number of compounds, each comprising 100–200 persons who lived in round huts built in native style. Most of the huts were found to be infested with *Ornithodorus moubata* and in some cases these were present in considerable numbers, and ticks could easily be collected from the sandy floors and cracks and holes in the walls. This community during 1940 and 1941 showed an average daily sick rate ranging from 2 to 3 per 100 daily population to between 4 and 5 per 100 in 1941. During the period July to December 1941, 600 blood smears had been examined and relapsing fever spirochaetes found in 158 (26·3 per cent.), indicating an incidence rate of about 20 per 1,000 per month during this period. For various reasons this figure must be regarded as an underestimate, for patients without fever escaped blood examination, smears were taken only of hospital patients, and the smears were not always taken at the most appropriate time for finding spirochaetes in the blood.

The distribution of cases in native groups shows that Africans from regions where the disease is endemic are less susceptible to infection than those exposed for the first time [see also this *Bulletin*, 1942, v. 39, 343]. No deaths from relapsing fever were recorded in this community and the death rate from all diseases was only 1·32 per 1,000 per month.

As a result of his investigation the author made the following recommendations :—

All natives reporting sick should be sent to hospital for medical examination. Where the clinical diagnosis is not obvious their blood

should be examined for spirochaetes at the height of the fever. Injections of an arsenical compound should be given to all patients suffering from relapsing fever during the height of the temperature.

In addition, attention should be paid to the housing of African employees and it is advised that all new huts should be rendered tick-proof by being built on a concrete or other solid base forming a hard, smooth, crack-free floor some two or three inches above the ground. The interior walls should have a smooth surface and be rounded off at the top where they meet the grass thatching and also at their junction with the floors. *E. Hindle.*

HAWKING, F. **The Action of Sulphonamides against** *Treponema recurrentis. Brit. J. Exper. Path.* 1944, Apr., v. 25, No. 2, 63–7.

An investigation of the prophylactic action of sulphapyridine and other sulphonamide compounds in suppressing infections of mice due to *Spirochaeta recurrentis.*

When infected mice were fed on a wet mash diet containing 1·5 per cent. sulphapyridine, the spirochaetal infection was either completely suppressed or its intensity much diminished. A similar activity was also shown by sulphathiazole, but not by other sulphonamides, including sulphanilamide, sulphadiazine, sulphamezathine, sulphacetamide, sulphaguanidine, irgamid, prontosil rubrum, and diaminodiphenyl sulphone.

It would seem that the anti-spirochaetal action depends on the presence of a pyridine or thiazole ring, rather than upon the sulphonamide-groups, but attempts to produce it with acetylsulphapyridine, pyridine-3-sulphonamide, or amino-pyridine sulphate were unsuccessful.

The anti-spirochaetal action is not antagonized by *p*-aminobenzoic acid, nor by nicotinamide.

Experiments with *Trypanosoma equiperdum* and *T. congolense,* using this technique, failed to reveal any antitrypanosomal activity of sulphapyridine and other sulphanomides. [See also ISHII *et al.*, this *Bulletin,* 1942, v. 39, 126; FELDT, *ibid.*, 344; VARGAS & ZOZAYA, *ibid.*, 693.] *E. Hindle.*

YAWS.

ITURBE, J. Comunidad del origen americano de las bubas y la sifilis. Discurso de orden. [**America the Common Source of Yaws and Syphilis.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 1905–106. [34 refs.]

The author chose this subject for his address at the closing session of a Venezuelan Congress of Dermatology and Venereology. It consists almost entirely of recordings from the literature on the time-honoured question of the identity or non-identity of yaws and syphilis, whether the latter was brought to Europe by Columbus on his return from America. He speaks of the absence of signs of syphilis in the bodies of Europeans prior to this return and the presence of bony lesions of the disease in the natives of America before Columbus's

arrival. He quotes also the experimental work of JAHNEL and LANGE [this *Bulletin*, 1926, v. 23, 18 ; 1927, v. 24, 304] who tried to inoculate yaws into a general paralytic without success. He does not adduce any evidence of work of his own on this subject and leaves us in doubt, as before. The reviewer has

". . . heard great argument
About it and about : but evermore
Came out by the same door as in I went."

H. Harold Scott.

LYONS, H. A. **Yaws. Report of a Case appearing in a White Man.** *U.S. Nav. Med. Bull.* 1944, May, v. 42, No. 5, 1168–9.

A medical officer in the Solomon Islands, who was treating cases of yaws there, was bitten on the left fourth finger by, it was thought, a centipede. Acute lymphangitis, with epitrochlear lymphadenitis, followed and was treated with sulphadiazine. Seventeen days later a sloughing punched-out ulcer appeared at the site of the bite and soon afterwards there was a maculo-papular eruption on the trunk. It was reported that spirochaetes resembling *Treponema pertenue* had been seen by dark-ground illumination on board a hospital ship and that the Kahn reaction at the same time had been strongly positive.

On admission to the base hospital there was a granulating area about 5 mm. in diameter, with moderate surrounding induration, on the dorsum of the middle phalanx of the left fourth finger ; the epitrochlear and axillary glands were enlarged, and a few scattered maculo-papular lesions were present on the trunk. An intramuscular injection of " Iodobismitol," 0·36 gm., was given on the fourth day after admission and recovery was uneventful. [See also this *Bulletin*, 1920, v. 16, 469 ; 1921, v. 18, 251 ; 1944, v. 41, 402.] *J. F. Corson.*

LOVERA, I. Observaciones clinicas de buba. [**Clinical Observations on Yaws.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 1073–92, 4 figs. on 2 pls.

After some preliminary remarks on yaws in general the author analyses cases which have come under his observation or which he has studied from records. Among nearly 9,000 cases, the primary lesion was on the dorsum of the foot in 21·7 per cent., on the toes in 3·2, on the legs in 20·5, on the ankle in 6·3, and knee in 4·1 per cent. ; that is, well over half were on the lower limb. The author analyses the tertiary lesions in 3,646 cases [not 3,678 as stated]. Of these, 2,644 had patches of hyperkeratosis ; 489 had gummatous ulcers, nearly all on the legs ; 201 showed chronic bursitis and small synovial cysts, mostly about the wrists or knees ; 185 had " framboesial rheumatism " and synovitis ; 57 had callosities or horny growths ; 47 osteitis or periostitis, goundou, etc. ; one had gangosa and 22 mutilating lesions of hand or foot.

H. Harold Scott.

DOMINGUEZ SISCO, R. Breve comunicación sobre el resultado de la reacción de Khan con sangre del cordon umbilical de niños cuyas madres han padecido buba. [**Khan Reactions with Blood from the Umbilical Cords of Infants whose Mothers had had Yaws.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 897–8.

In 1939 the author drew attention to the frequency with which positive Kahn reactions were obtained with blood from the umbilical

cord, and further study revealed that the mothers of these " cord-positive " children had, many of them, suffered from yaws. The present article deals with 119 mothers who had suffered from yaws, among 4,500 confinements in the Maternity Department. Ten of these were syphilitic and are excluded from this study. Of the remainder, 85 (78 per cent.) gave positive Kahn reactions. Since yaws patients practically always give a positive Kahn it seemed that pregnancy had some effect in reversing this. Seventeen of the 109 were admitted to hospital for abortion or attempted abortion, leaving 92 who gave birth to 93 infants. In 89 of them the cord-blood was tested and only 31 (34·8 per cent.) were Kahn-positive. In 15 of these the blood taken from the longitudinal sinus was tested later and it was found that *between the fifth and thirty-sixth days of life the serological reactions of these children became negative* [our italics]. The importance of this is obvious. If a child's blood be tested soon after birth, a positive Kahn reaction (resulting from yaws in the mother) may lead to an erroneous diagnosis of congenital syphilis, not only a stigma on the parents and child but perhaps the cause of prolonged and unnecessary treatment. Also, since the proportion of mothers who had had yaws and now gave a positive Kahn reaction was small, it would appear that pregnancy tends to negative the Kahn reaction which is positive in non-pregnant women with yaws. *H. Harold Scott.*

Vegas, M., Lovera, I., Miguel Itriago, P. & Medina, R. La campaña contra la buba en Venezuela. [**Yaws Campaign in Venezuela.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 1015–61, 8 charts and 1 map.

This campaign was begun in 1938 ; Commissions were appointed and the first started work in the Vargas Department at Carabobo and Yaracuy. In the two following years extension was made to include two other districts. The plan of campaign comprised, first a census of the population of each district, not always an easy matter, because much of it is nomad, but the local authorities did all they could to help. Next came treatment of all patients with the disease in an active stage and of those who showed old lesions of five or more years' standing, such as juxta-articular nodules, periostitis, gangosa, etc. Till the end of 1941 a lipo-soluble form of bismuth was used, but after that date an insoluble salt. Local application of an ointment composed of yellow oxide of mercury 20 gm., subcarbonate of iron 50 gm., balsam of Peru 100 gm., vaseline 1,000 gm., was also prescribed. In subsequent years re-examination was carried out as a measure of control, to note any new cases or relapse of those previously treated.

Specimens of the Forms of Return for record are reproduced in the article and many tables of figures for various districts and subdistricts. These would not interest the general reader. One example may be given to show the extent of prevalence. In Carabobo, 3,831 active cases (9·63 per cent. according to the table) and 5,392 (14·92 per cent.) old cases, a total of 9,763, or 24·55 per cent., were found. Altogether in 4½ years' work 256,793 persons were examined. Among these there were 16,484 active and 14,890 old cases, a total of 31,374. Of these 20,355 were cured, 8,832 improved ; 1,887 (mostly of the " old cases " group) refused treatment. Re-examination for control of results is not complete, but in two communities [size and numbers not stated] at the first re-examination 19 cases of fresh infection were seen ;

at the second, 1 only ; at the third and fourth, none ; at the fifth, 5 ; at the sixth, 36 ; but, it is stated, " 21 of these were from untreated zones " [presumably immigrants]. *H. Harold Scott.*

HELMINTHIASIS.

RATCLIFFE, H. L. **A Method for preparing Permanent Slides of the Ova of Parasitic Worms.** *Science.* 1944, May 12, 394.

Satisfactory permanent preparations of the ova of parasitic worms may be made by the following method :—

1. Prepare a series of dilutions of gum-chloral in 10 per cent. formalin, beginning with 10 per cent. and increasing by steps of 2 per cent.

2. Concentrate the suspension of faeces, that has been thoroughly fixed in neutral formalin, until each drop contains 10–12 ova.

3. Pipette 5 cc. of the concentrated suspension into each of a number of 15 cc. bottles, add an equal quantity of 10 per cent. gum-chloral-formalin to form a layer below the suspension, cap the bottles and stand until the faecal material has settled. Pipette off the supernatant fluid and add an equal volume of the next stronger solution of gum-chloral-formalin. Continue this until the ova are suspended in full. strength medium. After removal of excess fluid mount the last sediment under round cover glasses.

The whole procedure takes months but, except in the case of hookworm ova, the eggs are nearly all free from distortion. The method is also suitable for making preparations of adult hookworms and other small nematodes, mites, ticks, lice, larvae and pupae of flies. [The following formula for gum-chloral mounting medium for insects, etc., is given in " The Microtomist's Vade Mecum " (Bolles Lee), 10th Ed., 1937, p. 599 :—Distilled water 50 cc., gum arabic 40 gm., glycerin 20 cc. chloral hydrate 50 gm. Dissolve the gum in the water, cold, then add the chloral and dissolve with gentle heat, then add the glycerin and filter through cambric in a hot funnel.] *J. F. Corson.*

RUIZ RODRÍGUEZ, J. M. La schistosomiasis Mansoni en Venezuela. [**Schistosomiasis Mansoni in Venezuela.**] *Rev. Facul. de Med.* Bogotá. 1944, Jan., v. 12, No. 7, 361–6.

DUGUID, J. B. & SHEPPARD, Edith M. **A Diphyllobothrium Epidemic in Trout.** *J. Path. & Bact.* 1944, Jan., v. 56, No. 1, 73–80, 17 figs. on 5 pls.

The authors investigated the cause of the deaths of practically 100 per cent. of freshwater trout in an open storage reservoir in South Wales in 1942 and found that they were due to general peritonitis caused by the plerocercoids of a tapeworm belonging to the Diphyllobothriidae. The sticklebacks (*Gasterosteus aculeatus*) in the same reservoir were also affected. In March 1943 the tapeworm was found in trout from a smaller reservoir, separated from the first by only a narrow embankment, but it was not found in fish from the supply reservoir 25 miles away, nor in fish from other sources in the district.

When the plerocercoids were given in the food to laboratory rats and to one dog, they developed into adult worms which resembled

Diphyllobothrium latum; but they did not multiply when they were implanted into the subcutaneous tissues and peritoneal cavities of rats, but were encapsulated there.

The authors describe the life history to the procercoid stage in the Cyclopid Crustaceans *Diaptomus gracilis* and *Cyclops strenuus*, but had not, at the time of writing, succeeded in infesting fish by feeding them with infested Copepods.

Identification of species of *Diphyllobothrium* is difficult because only one stage of the life histories of so many of them has so far been identified. The identity of the species found in these trout has not been fully established. The adult, the coracidium and the procercoid, seemed to correspond with descriptions of those of *Dibothrium cordiceps*, which caused epidemics in trout in one of the Yellowstone Park Lakes; similar epidemics have occurred in Elk Lake, Oregon, and in California. Some helminthologists regard *D. cordiceps* and *D. latum* as being identical; others do not. Both the Welsh reservoirs in which the infested trout were found have been open to anglers for years. There was little evidence that birds (*e.g.*, the gull) brought in the infestation; a small mammal seemed to be a more likely carrier. One Belgian soldier, who was later found to be a carrier of *D. latum*, had encamped in the neighbourhood. In a footnote the authors say that from material sent to them from Dr. PETERSON of Yell, they gather that a species of *Diphyllobothrium* is endemic also amongst the freshwater trout in certain of the Shetland Islands.

The *Lancet* (1944, Apr. 8, 475) in an annotation points out that so far human infestation with *D. latum* has been reported in the British Isles only from the West of Ireland [O'FARRELL, this *Bulletin*, 1918, v. 12, 191]. Though the identity with *D. latum* of the parasite described is not fully established, there is a possibility that *D. latum* may have been brought into Britain by refugees from Norway or Poland. Its introduction to North America by immigrants has resulted in the establishment there of considerable endemic foci within recent years.

G. Lapage.

HICKEY, M. D. & HARRIS, J. R. **Definitive Hosts of a Species of Diphyllobothrium causing Mass Infection of Trout in Reservoirs: Preliminary Note.** [Memoranda.] *Brit. Med. J.* 1944, Sept. 2, 310.

Referring to the report by DUGUID and SHEPPARD (above) the authors record that seagulls and cormorants from the Dublin area are infected with an adult tapeworm of the genus *Diphyllobothrium*. They think that these birds are the naturally infected definitive hosts of the tapeworm found in that district. Trout from reservoirs near Dublin are heavily infected with plerocercoids of the family Diphyllobothriidae. All stages of development of the tapeworm, from the plerocercoid found in the fish to the adult stage, were found in the intestines of greater and lesser black-backed gulls (*Larus marinus* and *L. fuscus*), in herring gulls (*Larus argentatus*) and in cormorants (*Phalacrocorax carbo*). Investigation of the infection at Poulaphuca reservoir near Dublin is proceeding and will be reported later. *G. Lapage.*

TOTTERMAN, G. **On the Price-Jones' Curve in Tape-Worm Anemia.** *Acta Med. Scandinavica.* 1944, v. 117, No. 2, 135–44, 2 figs.

"The results of the examination of the Price-Jones' curve in 15 cases of tape-worm anemia were as follows:

"1. There was no correlation between the size of the mean diameter and the size of the standard deviation.

"2. Neither could a correlation between the size of the mean diameter and the red cell count be stated.

"3. On the other hand there was a close agreement between the red cell count and the size of the standard deviation, as the standard deviation was largest in the cases where the red cell counts were the lowest.

"4. These results agree exactly with the results that Mogensen and Price-Jones obtained in cryptogenetic pernicious anemia.

"5. In 4 cases of tape-worm anemia the curves were clearly asymmetrical and could be divided into one left and one main component as in cryptogenetic pernicious anemia (Mogensen). In 3 further cases, which have fairly symmetrical distribution curves, there is reason to believe that behind the abnormally great deviation is hidden not only a left component but a right component as well. The remaining eight curves are practically symmetrical but the increased mean diameter and standard deviation cause them to differ from the normal curve.

"6. The distribution curve in severe tape-worm anemia shows traits which are characteristic of cryptogenetic pernicious anemia."

[Though it is not very clear, this work was presumably done in connexion with infection by *Diphyllobothrium latum*.]

FOLEY, E. J. **Multiple Unilocular Hydatid Cysts.** *East African Med. J.* 1944, May, v. 21, No. 5, 152–3.

A native woman from the Singida District was admitted to Dodoma Hospital, Tanganyika Territory, with an enormous enlargement of the abdomen which had been developing for the previous five years. There were two large cystic swellings, each about the size of a football, situated near the liver and in hypogastrium respectively, a large swelling in each loin, and three or four movable swellings, about the size of a fist, were also present. Laparotomy was performed on October 14th, 1943, two days after admission. The swellings were hydatid cysts; the two largest were incorporated in the liver and uterus respectively, the loin cysts were attached to the kidneys and the smaller cysts were in the omentum and mesentery. There was a large retroperitoneal swelling between the two kidney cysts and in addition there were hundreds of cysts, varying in size from that of an orange to that of a pea, scattered over the peritoneum.

The cysts of the liver and uterus were emptied and a few cc. of 1 per cent. formalin were injected into them. One of the smaller cysts was dissected out and found to contain daughter and granddaughter cysts and "hydatid sand." The patient died on the following day and a post-mortem examination was made. The hooklets were those of *Echinococcus granulosus*. The liver cyst was unilocular. No cysts were found in lungs, thorax or skull. *J. F. Corson.*

BAUMANN, H. Eosinophile Pleuritis bei flüchtigem, eosinophilem Lungeninfiltrat. [**Eosinophiles in Pleural Effusion with Transient Eosinophilic Pulmonary Infiltration.**] *Schweiz. med. Woch.* 1944, Apr. 1, v. 74, No. 13, 326–8, 2 figs. [12 refs.]

A recruit, 21 years of age, when in excellent health was suddenly seized with a violent fit of coughing and, after it, had some difficulty

in breathing, but had no pain. There was no expectoration. Blood examination showed leucocytes 14,500, eosinophiles 25 per cent., and two days later 20,000 and 33 per cent.; two days later still 21,000 and 47 per cent. He had slight fever to 39°C., but this slowly fell to normal during the next ten days. He showed signs of pleural effusion and in this fluid and in the scanty sputum now being excreted, eosinophiles were numerous. In three weeks the man had regained his normal state of health. The author discusses Loeffler's syndrome [see this *Bulletin*, 1944, v. 41, 424, where other references are given], but within three months of the onset of his symptoms he was passing ova of *Ascaris lumbricoides* and anthelmintic treatment resulted in the expulsion of adult worms. It is most probable that his attack was due to larvae of *Ascaris* in the pulmonary stage of their development. Before his illness he was accustomed to eat raw salad at least twice a week.

H. Harold Scott.

Bull. U.S. Army Med. Dept. 1944, May, No. 76, 45–9. **Early Filariasis in American Soldiers.**

In this special article reference is made to two papers, not yet published, in which Wartman and King record observations on 268 cases of filariasis among American soldiers in the Pacific islands. In one island about one-fifth of the soldiers showed symptoms that were attributed to filariasis. The earliest onset of symptoms occurred three months after arrival. The first symptoms were pain and swelling or redness of the arm (38 per cent.), leg (14 per cent.), or scrotum (56 per cent.). Three categories of symptoms were formed: lymphangitis, of a limb or on the trunk; swelling of lymphatic glands; and acute inflammation of the scrotum, testis and spermatic cord, accompanied at times by exquisite pain. Some degree of eosinophilia was observed in about two-thirds of the patients, but about a quarter of the men had intestinal worms also, chiefly hookworm or whipworm. No microfilariae could be found in any of the patients though the search for them was thorough, and in two patients adult female filariae were found in lymphatic tissue by biopsy.

The intradermal test described by Taliaferro and Hoffman [see this *Bulletin*, 1931, v. 28, 214] and by Fairley [*ibid.*, p. 679] was used as an aid to diagnosis; the reaction was positive in 90·8 per cent. of 164 patients and in only 10·5 per cent. of the controls (persons who had never spent time in the tropics).

All except five of the 268 patients were returned to the United States.

It was conclusively shown that mapharsen [mapharside] and sulphathiazole were ineffective in the treatment of these cases.

Biopsies were made in 17 patients, the tissue removed being 20 lymph glands and four cord-like structures from areas of acute lymphangitis; adult male and female filariae were found in five. The female worms contained large numbers of eggs and microfilariae, but no microfilariae were found free in the tissues. Examinations for the presence of bacteria in these tissues gave negative results. The lymphatic glands showed granulomatous inflammation. Wartman suggests that the absence of microfilariae in the blood may be due to the vascular nature of the granulomata, the hyperplasia of macrophages, and the small number of worms found in the biopsies.

The histories prove that white persons can be infected during short visits to endemic areas and that signs and symptoms of filariasis may develop as early as three months after exposure to infected mosquitoes. [The species of filaria is not mentioned in the paper but as the mosquito, *Aëdes variegatus* (*Aëdes scutellaris pseudoscutellaris*), is referred to as the chief vector in the area of the Pacific islands, it may be concluded that it was *Wuchereria bancrofti*.] *J. F. Corson.*

Brocklebank, J. A. **Calcification in the Guinea Worm.** *Brit. J. Radiology.* 1944, May, v. 17, No. 197, 163–4, 3 figs.

Guinea worms in the subcutaneous tissues may become calcified after death and be revealed accidentally in radiographs. This is shown in three illustrations in the present paper ; one shows a worm in front of the knee below the patella, in another it is curled up in the foot, and in the third the whole length of the worm is clearly shown in the leg, resembling the appearance seen after injection with lipiodol. In some cases a small part of the worm only is calcified and it is then liable to be confused with other calcified tissues. *J. F. Corson.*

Minckler, D. **Rapid Clearing of Pin Worms** (*Enterobius vermicularis*) **for Class Study.** *Stain Technology.* Geneva, N.Y. 1944, Apr., v. 19, No. 2, 63–4, 1 fig.

The following method of making permanent microscopical preparations of *Enterobius vermicularis* gives sufficient detail for students' class work.

(1) Fix in 10 per cent. formalin. (2) Wash for several hours in running water. (3) Dioxan three changes, one hour each. (4) Carbol xylene (phenol 1, xylene 3), 24 hours. (5) Neutral xylene, 3 changes, a few minutes each. (6) Mount in dammar dissolved in xylene, and cover.

The various bottles can be inverted and drained as the worms stick to the glass ; for mounting they are picked up with a wide pipette.

The nerve ring is not visible but the digestive and reproductive organs are shown. *J. F. Corson.*

Mozzotti, L. & Chavira, C. Investigación de triquina en 600 diafragmas humanos de la cuidad de Mexico. [**Trichinella in 600 Human Diaphragms in Mexico City.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1943, Dec., v. 4, No. 4, 343–51 1 fig. [16 refs.] English summary.

" The examination of 600 diaphragms collected at autopsies performed in the city of Mexico, showed that 30 of them (5 per cent.) were infected with *Trichinella spiralis*.

" According to these results the incidence for trichinosis in Mexico appears to be lower than in other countries."

DEFICIENCY DISEASES.

STANNUS, H. S. **Some Problems in Riboflavin and Allied Deficiencies.** *Brit. Med. J.* 1944, July 22 & 29, 103–5 : 140–44.

The first part of these lectures is devoted to the discussion of "a syndrome recognized many years ago and then later further defined, and its relation to the condition to which the term "ariboflavinosis" was assigned by SEBRELL & BUTLER (1938)" [*Pub. Health Rep.*, Wash., v. 53, 2282]. In the second part is put forward a tentative explanation of the pathogenesis of the signs and symptoms of riboflavin deficiency and of their peculiar localization, based on an anatomico-physiological consideration of the capillary vascular system.

Just as, say, pneumonia was recognized as a clinical entity long before the discovery of the pneumococcus, so too a clinical syndrome had been distinguished many years before the proof by Sebrell & Butler that certain symptoms appeared in persons kept on a diet deficient in riboflavin, which in turn disappeared when riboflavin was administered.

Attention was first called by the author in 1911 to these symptoms resulting from a dietetic deficiency in association with pellagra and also unassociated with that disease. At the same time he pointed out the resemblance of the symptoms to those described by STRACHAN (1888) in what he called "Malarial Multiple Neuritis" in Jamaica, and in 1930 reference was similarly made to the paper by SCOTT [this *Bulletin*, 1919, v. 13, 372] on "Central Neuritis" in Jamaica of supposedly toxic origin.

In 1936 [this *Bulletin*, v. 33, 729–41 ; 815–25 ; 885–901] a number of observations on similar conditions by various authors in different parts of the world, including those by Fitzgerald MOORE and LANDOR & PALLISTER were collected together and reviewed in an article entitled "Pellagra-like Conditions"—"pellagra-like" because the individual symptoms occur in pellagra as well as dissociated from that disease, and not "pellagrous" as some subsequent writers have interpreted this expression.

The symptoms noted in all these observations, together with others since published, including those made during the Spanish Civil War and those cited by American authors under the term ariboflavinosis, are given in the form of a table.

Thus presented they form a most interesting series, which, the author suggests, demonstrates a single syndrome in more or less complete form, the variation depending on the degree and duration of the nutritional disturbance.

Included in this syndrome are : glossitis, cheilosis, angular stomatitis, a similar condition about the free margins of the prepuce, the eyelids, nostrils, vulva and anus, a dermatosis of the scrotum and adjoining part of the thigh, a mild erythema of the skin of the face and body with fine desquamation, diminution of visual and auditory acuity, certain other neurological symptoms referable to the central nervous system, slight mental changes, congestion of the conjunctiva and limbic plexus together with corneal vascularization.

The author says "Although there are reasons on epidemiological grounds for believing that all the signs and symptoms I have grouped together should be considered as parts of a single clinical entity due to riboflavin deficiency, we cannot at the present time exclude the possibility that some other factor—perhaps some other member of the vitamin B_2 complex—plays a part."

He prefers to speak of a " hypo-riboflavinosis," as death must occur long before a condition of a-riboflavinosis is approached.

The part played by riboflavin in carbohydrate metabolism as the link between the anaerobic dehydrogenase system and the aerobic cytochrome : cytochrome-oxidase : oxygen system is mentioned shortly, with a set of schematic equations which are useful in explaining the difficult problem of biological oxidation.

The author then goes on to develop his main thesis : " Perhaps we do not always realize that the vascular system has been developed for a single purpose—that of carrying to the immediate environment of each individual cell all the essentials to satisfy its needs, thus creating an environment comparable to that of a unicellular organism. The actual living parts of complex organisms are embedded in a fluid matrix constituting an internal environment the constitution of which normally remains constant," a truth crystallized in Claude Bernard's expression —" La fixité du milieu intérieur est la condition de la vie libre." It is pointed out " how *great* is the part played by the capillary system, how *many* its functions." The endothelium forming the capillaries constitutes " a tissue of great activity ; it must need a considerable amount of energy in order to carry on its functions, yet nothing is known concerning the metabolism and respiration of its cells. . . . I think the assumption is warranted that the endothelial cell respires in the same way as the cell of any other tissue, and that for its metabolic processes it must be supplied with sugar, oxygen and all those other elements essential for cell life—including riboflavin."

It is then suggested " that in the event of a deficiency in any one of these elements—or in some one of the elements—namely, riboflavin —the capillary endothelium will be one of the first, if not the first of the tissues to suffer the effects of interference with normal respiration and metabolism. The result of this anoxia, in the wide sense of the term, upon the capillaries is a derangement of function, which I shall refer to as ' capillary dysergia,' with the development of loss of tone, dilatation, and decreased flow. This in turn leads to a disturbance in the surrounding *milieu intérieur* and so to a metabolic disorder of the cells of the neighbouring tissue."

The second part of these lectures is devoted to showing how the signs and symptoms of hyporiboflavinosis may be explained on this idea of capillary dysergia.

The relative number of capillaries (capillarity) varies in different tissues, being proportional to the metabolic needs of each. It is suggested that the manifestations of riboflavin deficiency will become apparent first in those tissues with high metabolic activity and a high degree of capillarity.

In turn the lesions of the skin, lips, tongue, etc., and the ocular manifestations, are dealt with. The author believes that the vascularization of the cornea is a process quite apart from the congestive signs in the conjunctiva and limbus. Evidence is also adduced for believing that riboflavin reaches the cornea through the lachrymal secretions and the suggestion is made that the corneal vascularization in vitamin A deficiency is, in fact, due to a local riboflavin deficiency.

The loss of visual acuity which American writers have ascribed to changes in the ocular media, the author believes to be due to a capillary lesion in the central nervous system ; so, too, the diminution of auditory acuity.

The section dealing with the neurological symptoms which the author has admitted to the syndrome, though speculative, is one of the most interesting and stimulating.

The distribution of the initial disorder in the central nervous system is determined by the relative "capillarity" in different areas and different elements of nervous tissue. In this syndrome it is the capillaries supplying the "neurophyl" or "mass of protoplasmic strands contributed by dendrites, terminal axon arborizations, and other synaptic structures" of the cerebellum which are first affected. The condition is one, the author suggests, that precedes that described by Adolf Meyer as "central neuritis." Upon this basis an explanation is offered for what has been described as the lack of systematization of the neuropathological lesions in pellagra and allied conditions.

H. S. Stannus.

[References are not given in the original paper, which is the abridged version of the Lumleian lectures delivered before the Royal College of Physicians of London on April 18th and 20th, 1944, but in the author's reprints there is included a bibliography of some 167 references.—*Ed.*]

SANDSTEAD H. R. **Deficiency Stomatitis.** *Pub. Health Rep.* Wash. 1943, Suppl. No. 169, 7 pp., 6 coloured figs. on 2 pls. [13 refs.]

The author describes changes in the mucosa of the cheek which, in view of the results obtained with riboflavin therapy, he suggests are a manifestation of ariboflavinosis. These changes vary in degree: (1) The mucosa has an oedematous appearance, the normal capillary network and characteristic epithelial pattern are obliterated, but there is no colour change. (2) The mucosa becomes an opalescent milky colour and the surface has an irregular cobblestone appearance; the occlusional line becomes marked and indented by the teeth. (3) The mucosa has a pronounced whitish or grayish-white colour, is much thickened, at times even shaggy, desquamation occurs and punched-out, shallow, non-tender and non-inflammatory erosions appear.

A third of a group of persons examined in a survey exhibited the condition—(1) 275, (2) 54, (3) 30; total 359 out of 1,061.

[Others will recognize these mucosal changes, but some doubt must exist as to the diagnostic value of riboflavin therapy as given by the author.] *H. S. Stannus.*

HAEMATOLOGY.

VAN DER SAR, A. Anemia con eritocitos en forma de hoz en la gestación. [**Sickle-cell Anaemia in Pregnancy.**] *Rev. Policlinica Caracas.* 1943, v. 12, No. 68, 12 pp., 2 figs. [19 refs.]

There is much yet to be learnt regarding sickle-cell anaemia; hence, all good records of cases are valuable at present. Sicklaemia is very largely, almost exclusively, a disease of the negro race. Between 8 and 9 per cent. of the negro population of North America have been shown to exhibit this trait and 1·5 per cent. of these suffer from anaemia. Among others it is very rare, but cases have been reported in a Greek, in Sicilians (two) and in Italians (two). Its presence

among pregnant women is practically limited to younger mothers because those with this condition usually die of it or of some intercurrent disease before attaining the age of 30 years. From the records, the youngest was 18, the oldest 30, and the average 22·4 years. The chief features of the blood are a reduction of red cells to about half the normal, with corresponding fall in haemoglobin so that the colour index is about unity ; there is an increase in reticulocytes and a considerable number of erythroblasts, with a marked leucocytosis.

The patient in the present record was a negress, a native of Saint Eustatius, Leeward Islands, and born in 1913. In 1939, at the age of 26 years she came to hospital, pregnant, and suffering from severe anaemia. She had been pregnant twice before ; the first ended in an abortion at three months, the second resulted in the birth of a boy at term, now five years old and healthy, Now, the anaemia was marked, with widespread oedema, and a transfusion of 500 cc. blood was given. Male twins were born prematurely at seven months, both dead. She left hospital two months later, in February 1940.

In January 1941 she again presented herself at hospital, anaemic and again pregnant, four months. The blood pressure was 102 mm. systolic, 60 mm. diastolic ; liver and spleen were both enlarged (the liver had been, but not the spleen on the previous occasion). She was not seen again till June, when she was very short of breath, anaemic and suffered from palpitation. She was treated with intramuscular injections of a liver preparation [not stated which] and she made excellent progress and gave birth to a child at full term. She left hospital the following month. Examination of the child's blood showed no signs of any sickle cells. *H. Harold Scott.*

Dhayagude, R. G. **Erythroblastic Anemia of Cooley (Familiar Erythroblastic Anemia) in an Indian Boy.** *Amer. J. Dis. Children.* 1944, Apr., v. 67, No. 4, 290–93. [11 refs.]

DERMATOLOGY AND FUNGOUS DISEASES.

Furnell, M. J. G. **Foot Lesions in Africans.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1943, Dec., v. 37, No. 3, 217–20, 5 figs. on 1 pl.

So-called " yaws of the feet " was a common cause of rejection of West African recruits for military service ; as there was some doubt about the nature of this condition, the author examined the foot lesions found in African soldiers, most of whom belonged to the Northern Territories of the Gold Coast. The following conditions were commonly seen :—

1. *Cracked soles.*—The skin showed long cracks, sometimes forked, at an acute angle with the skin. They are relatively painless and are probably due to excessive drying and trauma from sand particles.

2. *Pitting of the thick skin of the sole.*—This seems to be the same as the condition called by Castellani " keratoma plantare sulcatum " [see " Manual of Tropical Diseases " by Castellani & Chalmers, 1919, 3rd ed., Baillière, Tindall & Cox, London, p. 2253]. It consists

of small round holes in the skin and is probably caused by minor trauma as by walking on hard gravel, associated with frequent wetting of the feet.

3. *Corns* (*verruca plantaris*).—This was the only really painful condition met with.

4. *Rat-bite.*—This was caused by the nibbling of rats while the man was asleep.

5. *Disease of the skin of the instep.*—A scaly condition was seen in two men.

6. *"Cut-onion" effect.*—It is a very common condition; a round area with concentric circles is seen, especially on the heel. It is due to grinding the heel into the laterite during foot-drill.

7. *Other lesions of the foot.*—These included guineaworm infection, blisters, and other minor traumata.

Treatment with arsenic and bismuth, for yaws, had little effect on the lesions but improvement followed permission to wear sandals. The author regards sandals as an ideal preventive against these skin lesions, though they are less protective than boots against snake bites, jiggers, leeches and other injuries. *J. F. Corson.*

Briceño Rossi, A. L. & Iriarte, D. R. Breves notas sobre últimas investigaciones verificadas en las zonas pintógenas de Venezuela en relación al estado actual del conocimiento del Carate o Mal del Pinto. [**Recent Studies in the Pinta Regions of Venezuela.**] *Bol. Laboratorio Clinica "Luis Razetti."* Caracas. 1944, Mar., v. 4, No. 13, 221–35, 2 figs. [53 refs.]

Lesions described by León y Blanco under the designation *pintids* are known locally in Venezuela as *toto* or *carampancho*. Regarding these the authors have come to the following conclusions:—

1. Pinta may start with dermal lesions, erythemato-squamous, lichenoid or papular, designated *toto* or *carampancho*.
2. For diagnosis the spirochaete must be looked for by dark-ground illumination.
3. Carampanchos (pintids) in which the spirochaete is found must be treated as for syphilis.
4. Those in which the spirochaetes are not found call for treatment with ointments having a salicylic acid base, as for cases of dermatomycosis.
5. If a patient with *carampancho* in a pinta region does not get well with salicylic acid ointment, the lesion is almost certainly an early pintid and should be treated with injections of bismuth.

Serological studies have shown that active pinta with spirochaetes present gives in all cases positive results with the Wassermann, Kahn, Kline and other tests for syphilis; also, old cases, with or without spirochaetes, which have undergone spontaneous cure leaving lesions like vitiligo, give positive serological tests in 52 to 81 per cent.

As regards the vector, examination of large numbers of Simuliidae has not revealed the presence of spirochaetes; other insects such as *Phlebotomus*, Culicines, Anophelines and ticks are being examined, but the authors are inclined to believe that transmission is by contact, prolonged and intimate, as in the case of leprosy. They suggest again that those engaged in anti-yaws campaigns should at the same time undertake anti-carate work. *H. Harold Scott.*

Briceño Rossi, A. L. & Iriarte, D. R. Breves notas sobre ultimas investigaciones verificadas en las zonas pintogenas de Venezuela en relación al estado actual del conocimiento del carate o mal del pinto. [**Notes on Pinta in Venezuela.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 1001–13, 4 figs. on 2 pls. [53 refs.]

Study of the healthy parts of the skin of pinta subjects and of the skin of those with non-dyschromic lesions has not resulted in the finding of any pinta spirochaetes. The primary lesions are some six times as frequent on the limbs as on the face or covered parts. Pinta lesions not associated with the presence of the spirochaete rapidly clear up on treatment with ointments having a salicylic acid basis, but if the spirochaete is found these ointments have no effect, and bismuth or an arsenical is necessary. Pinta subjects may have suffered from yaws or may do so later, proving that there is no immunological relationship between them. Since, however, the same lines of treatment are effectual in both, the suggestion is made that campaigns instituted against yaws should at the same time undertake to deal with pinta.

The question of transmissibility, and in particular, of a transmitting insect vector, is still unsolved. *Phlebotomus*, culicines, anophelines, ticks, etc., have been tested, so far without any definite findings. In consequence, it is suggested that carate may have a long incubation period, like leprosy. *H. Harold Scott.*

Rodriguez Navarro, M. Tratamiento del carate. [**Treatment of Pinta.**] *Rev. Sanidad y Asistencia Social.* Caracas. 1943, Oct., v. 8, No. 5, 1093–4.

The author gives details of the method of treatment he adopts in cases of *mal del pinto*. He divides his patients into three categories : (1) Those in the early stage, when the disease is first recognizable. To these he gives ten ampoules of bismuth subsalicylate, each of 1 cc. containing 10 cgm., and injects one each week. The spirochaete, he states, is not found after the sixth injection. (2) Those whose disease is of not more than two years' duration. To these he gives a series of bismuth injections followed by a series of arsenicals [nothing further is specified as regards either dose or number of injections]. By this time no spirochaetes are found and the patient is no longer infective (sanitariamente curado), but a second series of both drugs is given to ensure real cure (medicamente curado). (3) For those in later stages, that is of over two years' duration, treatment is varied according to age. For those under 40 years he gives a series of bismuth injections, followed by a series of arsenicals and a second of bismuth ; then, after an interval of four weeks he gives a third series of bismuth injections. For those over 40 years he gives three series of bismuth injections separated by intervals of a fortnight. [The paper loses much of its value owing to omission of the name of the arsenical used, the dose of it or the number of injections in a series. For the second or third class these details are not given for the bismuth either, but presumably the dose and course laid down for the early cases are implied as constituting " a series " for the other two.] *H. Harold Scott.*

Hitch, J. M. **Dermatitis Venenata caused by Semecarpus atra.** *U.S. Nav. Med. Bull.* 1944, May, v. 42, No. 5, 1111–15, 2 figs.

More than one member of the Anacardiaceae are liable to set up a contact dermatitis. *Semecarpus anacardium*, the " marking nut "

(so called because the juice of the nut is used for marking clothes) has been shown to be one cause of the well-known Dhobie itch of the tropics [see this *Bulletin*, 1944, v. 41, 230–1].

The cases referred to in this account arose from contact with another species, *Semecarpus atra*, and not with the fruit but with the trunk of the tree. It grows freely in New Caledonia, the Loyalty Islands, Isle of Pines and the New Hebrides group. It has a straight trunk, 30 feet or more in height, with widely spreading branches, leaves dark green above, glaucous below and with a red fruit shaped like the cashew nut (another member of the same family, Anacardiaceae). If the bark is removed for any purpose, such, for example, as for camp construction, or is injured, a sticky, milky latex is exposed or exudes and becomes black and tar-like (this is used for making Chinese lacquer). This latex is the noxious substance.

The author relates that about half of a number [unstated] of men engaged in erecting a mess hall, using this wood as the timber for its construction, suffered from a serious dermatitis, starting as a pruritic erythema, then presenting closely packed superficial vesicles. These in two to three days became flaccid, ruptured and coalesced to form an extensive oozing surface, a self-propagating eczematous condition from auto-inoculation and local spread, lasting for two, perhaps even up to four, weeks before subsiding. Cases were most often seen in the summer months and the symptoms were more severe when the skin was wet from rain or sweat.

Both in accidental cases and in volunteers who offered themselves for experimental testing of the latex, the interval before the onset of symptoms might be prolonged to as much as five days; the erythema was never seen in less than 48 hours after contact. The usual treatment by lotions and, in the eczematous stage, by soothing emollient preparations brought about a cure. The native method is to apply powdered charcoal to the areas involved, and to leave this until the crusts separate—as a rule in about a fortnight. *H. Harold Scott.*

Martin, W. P. & Silber, B. **Histoplasmosis of Darling (Reticulo-Endothelial Cytomycosis). Case Report.** *Amer. J. Clin. Path.* 1944, Feb., v. 14, No. 2, 119–24, 3 figs.

The case described illustrates the difficulty of diagnosing histoplasmosis on clinical evidence alone, unsupported by the findings of the pathologist or mycologist. The patient, a woman aged 39, had been suffering from diabetes for about ten years. During the last year of her life she was admitted to hospital for examination no less than ten times, suffering from fever, abdominal pain, dysuria and loss of weight. Apparently, the only objective signs found were enlargement of the liver and spleen and some evidences of broncho-pneumonia. No clinical diagnosis was reached, and shortly after the tenth admission to hospital an exploratory laparotomy was performed with fatal result. At autopsy granulomatous lesions were found in the lungs, liver, spleen, adrenals and kidneys. Microscopical examination showed, in some of these granulomata, small collections of capsulated, Gram-positive, intracellular organisms which were identified as *Histoplasma capsulatum*. *J. T. Duncan.*

MISCELLANEOUS.

MONTHLY BULL. MINISTRY OF HEALTH & EMERGENCY PUB. HEALTH LAB. SERVICE (DIRECTED BY MED. RES. COUNCIL). 1944, July, v. 3, 108–10. **Disinfestation of Aircraft and Aerodromes. Report of the British West Indian Quarantine Conference, Trinidad.**

"The problems of preventive medicine due to air transport increase daily, and a summary of the report of the Technical Sub-Committee dealing with disinfestation of aircraft which was appointed by the Quarantine Conference held at Port of Spain, Trinidad, in November 1943, will interest many medical officers. The Technical Sub-Committee consisted of P. G. Stock (Ministry of Health, Chairman), G. Bevier (Rockefeller Foundation), G. L. Dunnahoo (Asst. Surg. Gen., U.S.P.H. Service), T. J. Hallinan (D.M.S., Jamaica), J. D. Long (Pan American Sanitary Bureau), N. M. MacLennan (D.M.S., Trinidad), F. P. Schuitemaker (Dutch East Indies), R. C. Shannon (Rockefeller Foundation), M. C. Stayer (Maj. Gen., U.S. Army Med. Service), R. O. Williams (Acting Director of Agriculture, Trinidad), T. L. Shinnick (U.S.P.H. Service), F. H. Forman and M. C. Arner (Pan American Airways) and R. Norris (Secretary). It was appointed to consider the spraying of aircraft and the keeping of aerodromes free from mosquitoes.

"The main *conclusions* reached were the following :—

"*As regards methods of spraying.*

"(i) Military planes should be dealt with on similar lines to civilian planes.

"(ii) Cargo planes, which in many cases also carry passengers, present special difficulties.

"(iii) The most practical method is to spray aircraft on the ground prior to departure.

"(iv) If spraying is thoroughly carried out with an efficient insecticide after all baggage and mail has been loaded and immediately before the passengers enter the plane, the residual spray will be sufficient to kill insects which might enter with the passengers. The embarkation of passengers should be carried out as quickly as possible. It should be completed and the plane closed before the ventilating system is brought into use.

"(v) After the main disinsectisation has been carried out on the ground, a further spraying in the air may be advisable, as an added precaution to ensure the destruction of insects which may have entered the plane. Such additional spraying is specially important if any delay occurs in the embarkation of passengers or if the plane be traversing or departing from a particularly dangerous area.

"(vi) Disinsectisation is best carried out by dispersing the insecticide in a low-boiling solvent 'Freon."* The next best method is by 'power' spraying; but, failing the necessary apparatus, use the best sprayer available, to obtain as fine a mist as possible.

* "Freon" or dichloro-difluoro-methane (which is used as a refrigerating agent) is a low boiling solvent, and the pressure of the solvent is used for the spraying. Little equipment is needed for the production of aerosols by this method, but the container must have a liquid delivery tube extending to the bottom, since the solution, and *not* the gas, is to be sprayed. Only a small orifice is used so that no expansion takes place until the solution is sprayed into the atmosphere. Aerosols produced by this method are much more finely divided than the mists produced by most spraying methods, and they settle more slowly. (Editor.)

"As at present supplies of 'Freon' are limited, 'power' spraying should be used for ground disinsectisation of aircraft, and such supplies of 'Freon' as are available should be reserved for the spraying of aircraft during flight.

"(vii) All enclosed spaces should be dealt with, particularly the luggage, passenger and crew compartments, including lavatories and other cabin accommodation. Particular attention should be paid to the potential harbourage afforded in many passenger planes by the custom of hanging clothes in the rear of the passenger compartment.

"(viii) Pyrethrum is the insecticide of choice. The quantity required per unit of air space depends on the method of application, but as a general rule 8 cc. of the standard pyrethrum extract (2 grams of pyrethrins per 100 c.c.) should be used per thousand cubic feet of air space with an exposure time of not less than five minutes. It is emphasized again that efficiency depends on *enough* of the finely atomised insecticide to kill mosquitoes being sprayed to *every* part of the space to be dealt with.

"If pyrethrum is not available, an amount of an approved insecticide which will give equivalent results to the foregoing standard may be substituted.

"*As regards administrative action.*

"(*a*) It is impracticable at the present time to set up an organisation adequate to carry out disinsectisation at every air port at which an aeroplane might alight.

"(*b*) The responsibility for spraying, therefore, should be placed on the flight personnel whether the operation is carried out on the ground or in the air.

"(*c*) The work should be under the general supervision of the health authority of the aerodrome.

"(*d*) An entry that disinsectisation has been carried out should be made in the journey log book or other appropriate document.

"(*e*) It is of great importance to keep aerodromes free from mosquitoes and other insect vectors of disease, as routine spraying of aircraft cannot be relied on as 100 per cent. effective.

"(*f*) Apart from airport buildings, a building-free zone of at least a quarter of a mile should, as far as practicable, be maintained at airports. All buildings in the vicinity should be supervised to prevent their constituting a menace to the aerodrome through mosquitoes, rats and other vectors of disease.

"*As regards specially dangerous areas.*

"The classification of areas was discussed but the conference considered that sufficient knowledge is not yet available to enable definite recommendations to be made. The matter is of such importance that it should be dealt with by an international body.

"Meanwhile if an epidemiological bureau is established for the British West Indian area, representatives of that bureau and of the Pan American Sanitary Bureau could advise on the classification of areas, and as to the necessity of spraying in pre-determined localities.

"*Vectors of plant diseases.*

"The question of quarantine measures against vectors of plant diseases was also discussed with Mr. Williams, the Acting Director of Agriculture, Trinidad. It appeared, however, that the measures to be taken in this regard are generally different from those required to be taken against

mosquitoes and the Committee concluded that the Conference should not attempt to make specific recommendations in this respect.

"Finally the Committee emphasized that their recommendations and opinions were based on present knowledge, and that these recommendations may require modification in the light of further knowledge."

MEGAW, J. W. D. **Hints on Health in India.** 1942, 27 pp.

There are few people so competent as the author of this pamphlet to write of conditions in India with the authority that comes not only from long residence, but also from critical and active interest in medical science. The pamphlet is intended for laymen, and in it the author has overcome the difficulties of presenting to the uninitiated the bare bones of disease transmission, while maintaining at once interest and scientific accuracy. The subject is apposite at the present time, and a gift of this small publication to each soldier travelling to the Far East might do much to minimize the disease rates of the forces engaged in that theatre of war.

The subject matter is divided into two main sections, on the maintenance of physical fitness, and the avoidance of preventable disease. Climate, clothing, housing, exercise, diet, alcohol, smoking, and work are dealt with in the first section, and the advice given is plain, direct and wise. In the section on preventable diseases the alimentary infections, droplet diseases, insect-borne diseases, contact diseases, helminthic infections, heat stroke, snake-bite, dog-bite and other matters are dealt with in the same brief and authoritative style. It is good to see that some of the old bogeys are destroyed—red spine pads, the necessity for wrapping up in a thick coat after hard exercise —but the reviewer would have welcomed the last obsequies of the cholera belt, here only half buried.

The pamphlet can be recommended to all persons travelling to the East. *Charles Wilcocks.*

HILLMAN, C. C. **Medical Operations in the Pacific Theaters.** *Virginia Med. Monthly.* 1943, Dec., v. 70, 594. [Summary prepared for *War Medicine*, Chicago.]

Hillman points out that military service, especially in overseas theatres, tends to bring out potential emotional deficiencies. Notwithstanding much more careful selection of inductees than that practised in World War I and intensive efforts to eliminate the emotionally weak among trainees at replacement training camps, psychoneuroses have constituted a major cause of non-effectiveness. Distance from home, general absence of facilities for recreation, discomforts of a tropical climate and rigors of combat appear to be the principal factors.

Fear reactions, mutism, tremors, exhaustion states and other acute psychoneuroses have occurred during combat. In the Pacific areas, as in other theatres, prompt sedation, rest and adequate nourishment have been most effective.

Among tropical infections malaria stands out as the arch enemy. There is no other disease which so vitally affects the war effort. It has produced much more ineffectiveness and many more hospital admissions in some theatres than have battle casualties.

The chief vector of malaria in the Pacific areas is Anopheles punctulatus, variety moluccensis. It is an avid feeder and will bite even in the daytime in the dark, damp jungle and in coconut groves. In one hyperendemic area where observations were carried out there were 17 clinical cases of malaria in forty-one days in a group of 50 soldiers.

Medical department officers should take an active part in developing malaria consciousness and malaria discipline among troops. The individual soldier must use his anti-mosquito weapons as automatically and efficiently as he uses other weapons. Indoctrination must start in the continental United States and be continued overseas.

The death rate from malaria has been low, but, notwithstanding the best therapy, the recurrence rate has been high. Plasmodium vivax infections have a higher recurrence rate than infections with Plasmodium falciparum. Quinacrine hydrochloride and quinine properly administered appear to be equally efficacious in clearing the usual acute manifestations of the disease and in preventing recurrences. For the occasional severe infection accompanied with cerebral or other complications quinine has the advantage that it can and should be administered intravenously.

Dengue has appeared in Northern Australia, New Guinea, the Solomon Islands and other islands of Melanesia. It has been the cause of considerable suffering and noneffectiveness on the part of military personnel operating there. Fortunately, the disease is never fatal. Its prevention lies in the elimination of mosquito breeding and avoidance of their bites.

Cutaneous infections rank next to malaria as a cause of non-effectiveness in Pacific theatres. Their incidence, extent and severity are much greater because of the increased humidity, excessive perspiration, frequent wetting of the feet and imperfect laundry facilities.

Dysentery, chiefly bacillary, has been encountered. Except early in the New Guinea and Guadalcanal campaigns, it has not constituted a serious problem.

Tsutsugamushi, or scrub typhus, has occurred in troops in Northern Australia and New Guinea. Its incidence has been comparatively low, but it assumes importance because of a death rate of approximately 5 per cent. The disease has the clinical characteristics that are usually associated with louse-borne typhus. An interesting and frequent observation is a small ulcer on the thigh or lower part of the abdomen where the infected mite penetrated the skin. Careful nursing, generous administration of fluids by mouth or parenterally and a strict regimen in bed, continued for at least two weeks after subsidence of the acute manifestations, are the therapeutic indications. Ordinary typhus vaccine offers no protection. Aside from using insect repellents, clearing away vegetation and avoiding areas of tropical growth likely to harbour the mite vector, no specific measures are known to prevent the infection or to influence the course of the disease.

Neither plague nor cholera has yet been encountered among American troops in the Pacific theatres. Venereal disease has not been a serious problem.

During combat, evacuation of casualties from the field, and later to the communications zone, has constituted a major problem. Because of swamp, jungle or rough terrain use of the standard army ambulance has rarely been possible. Because of their peculiar ability to keep going under all conditions, jeeps fitted with frames to hold two or three litter patients have frequently served as substitutes. Wounded

men have been floated down jungle streams on pneumatic life rafts. In most instances, however, primary evacuation has been accomplished by hand-carried litter. It is at this point that the native carrier, accustomed to carrying packs long distances through slippery jungle, has proved invaluable. Secondary evacuation has been effected largely by air.

BRAZZAVILLE [AFRIQUE FRANÇAISE LIBRE]: **Rapport sur le Fonctionnement Technique de l'Institut Pasteur en 1942** [CECCALDI, J., Director] [**Report on the Work of the Pasteur Institute in 1942**]. 80 pp., 6 figs. & 4 charts. Brazzaville: Imprimerie officielle de l'A.E.F.

The war prevented the Pasteur Institute at Brazzaville from obtaining vaccines and sera from the parent institute at Paris. The whole time of the two doctors, the Director and his colleague, was taken up with the various activities of the institute, which included water analysis, microbiological and serological examinations, antirabic vaccination, histopathology, the preparation of various vaccines, the collection of snake venom, and sleeping sickness work. The experimental animals maintained at the laboratory were white mice (1,500–3,000), white rats (200), rabbits, guineapigs, monkeys, sheep, fowls and pigeons.

Vaccines and sera.—Epidemics of cerebrospinal fever occur every year during the dry season and large quantities of vaccine are used; 438,400 cc. were prepared in 1942 and antimeningococcal serum was also produced. Considerable quantities of vaccines against rabies, pneumonia, staphylococcal infections, plague and typhoid fever were made.

Snake-venom.—Dried venom of *Bitis gabonica* and *B. nasicornis* was prepared in considerable quantity and sent to Dr. Grasset at the South African Institute for Medical Research, Johannesburg; antisera were made there and sent to the French African colonies.

Abortus fever.—Details are given of a case in a European woman at Brazzaville, who became infected by drinking milk from a recently imported herd of cattle [this case has already been noticed in the *Bulletin of Hygiene*, 1944, v. 19, 527.].

Sleeping sickness.—New cases numbered 147, only 44 being in the first stage; the majority were sent to the laboratory from various dispensaries or by officials. It is well known that when doctors tour the infected areas, about 85 per cent. of the new cases are in the first stage of the disease, whereas when the patients are first examined after being sent to the laboratory or after coming of their own accord, from 80 to 100 per cent. are found to be in an advanced stage. Early cases were treated in a variety of ways with different drugs—270 F. (acetarsol or stovarsol], tartar emetic, tryparsamide, moranyl [Fourneau 309 or Germanin]. Six weekly doses of 270 F, 0·5—1 gm. + moranyl, 0·25 gm. are stated to have been insufficient, but 12 weekly doses gave satisfactory results; in one case the trypanosomes were still present in the blood after the sixth dose. The advanced cases also were treated with various combinations of drugs. Notes are given of 17 fatal cases, the duration of the disease ranging from two months to 14 years; all received courses of tryparsamide as well as other drugs.

A few pages are devoted to records of animal and agricultural research. *J. F. Corson.*

(For the Yellow Fever section of this paper see above p. 846.)

GAMBIA: SESSIONAL PAPER No. 8/1943. **Notes on Village Planning and Building in the Protectorate.** 23 pp., 4 folding plans, 1943. Bathurst: Govt. Printer.

This is a useful endeavour to furnish a guide for village construction. It emphasizes that in planning village housing the headmen and the people should be consulted in order to avoid difficulties arising from such things as their habits, religious customs, likes and dislikes, and other matters which are of social significance and may affect any scheme of lay-out. The village site should be off the main road with an area sufficient for adequately sized building plots, recreation grounds and other open spaces, a medical compound with clinics, and for sanitary units with various methods of disposal. It is expected that much of the labour incurred owing to building on the site could be eliminated by pre-fabrication. Where direct labour is used the employment of two full-time Europeans—one in charge of supplies and one for supervision—is suggested. Formal approval of all plans is prescribed.

The *site* is to be levelled and drained; it must not be on refuse-filled ground except by written permission. It is to be chosen in collaboration with the headman of the village. The *area* covered by the buildings is not to exceed one half of the total area of the building plot. A *room* intended for human habitation shall be not less than twelve by ten feet in area, with a mean height of not less than nine feet. Eaves are not to come below the level of any window, nor reach nearer the ground than five feet six inches; nor must they approach nearer the boundary of the plot than two feet. The *level* of the floor is to be at least six inches above the level of the surrounding ground of the plot. *Ventilation* is to be provided under all boarded floors, and also for each room. For *light*, at least one window in each room to open to the external air, and the window area of each room must not be less than one-eighth of the floor area of that room. *Walls* of the double or cavity type are prohibited. The *roof* is to be covered with non-inflammable material—tiles, slates, corrugated iron or other. Roof gutters are not to be used without written permission.

Rat-proofing.—The space under the floor must be proofed; the prohibition of double or cavity walls noted above is directed against rats. The space between a ceiling and the roof is to be rendered rat-proof, and is also to be accessible by a trap-door; any food store is to be proofed; walls round the plot are also to be made rat-proof.

Latrines.—A latrine is not to be erected within six feet of any inhabited room or kitchen, pantry or food store.

Hedges.—The hedges enclosing the plot are not to exceed six feet in height.

There are four appendices: I. Square plan of chief's village; II. Radial plan of chief's village; III. Plan of single-street village; IV. Plan of rural sanitary unit.

[In the choice of a site the advice of a malariologist or an entomologist would be of value. As regards hedges, some provision should be made to exclude mosquito-breeding plants from being used. When local names are employed for materials they ought to be defined; it would be better to avoid them. "Krinting" (Gambia), "concrete nog" (Jamaica), and so on, add to difficulty unless defined. A ready means of identifying the materials used in different countries is desirable and a statement of the composition would probably best provide this means.]

D. B. Blacklock.

HUDSON, E. H. **The Role of the Reservoir Host in Tropical Disease.** *Amer. J. Trop. Med.* 1944, Mar., v. 24, No. 2, 125–30.

In four tables the author gives information (admittedly incomplete) concerning the reservoir hosts of the following groups of parasites affecting man: helminths, protozoa (including spirochaetes), bacteria (and moulds), and viruses (including rickettsiae). Each table is subdivided into three sections, dealing with the mode of infection, whether by ingestion, by vectors or by contact. A reservoir host is defined as a lower animal which shares some disease or parasite with man, and the author distinguishes between reservoir hosts and vectors.

From the tables, it is observed that most helminthic infections are acquired by ingestion, most protozoa by way of vectors, bacteria by all three routes, and most viruses (including rickettsiae) by vectors. In civilized communities in temperate climates there are still animal reservoirs of tularaemia, plague, tick-borne and flea-borne typhus, leptospirosis, rabies, brucellosis and equine encephalomyelitis, but the principal diseases are those indigenous to man. In the tropics, however, the position is very different, and the animal reservoir host plays a prime rôle.

The author asserts that in many respects interest in tropical disease has been concerned too much with the white man in the tropics, and too much with the clinical aspect. He urges a wider, more biological outlook, and a greater attention to environmental study, and in that study the reservoir host will bulk large. *Charles Wilcocks.*

WHITLEY, G. P. **Poisonous and Harmful Fishes (Division of Fisheries—Report No. 10).** *Commonwealth of Australia. Council for Scientific and Industrial Research. Bull. No. 159.* 28 pp., 16 figs. & 3 coloured pls. 1943. Melbourne: Govt. Printer.

This is an excellent short monograph on the fish to be avoided or handled cautiously in the waters of Australia and the south-western Pacific. Visitors, immigrants and members of the Allied Forces in these regions are often unaware of the risks to which they may be exposed, and this work will give them all the enlightenment they need. It is written in plain, simple language, for it is designed for the instruction of non-medical persons, though doctors also will profit from reading and studying it. When a stranger in a new country sees an attractive or peculiarly coloured fish he usually wishes to catch it, if not for food, to add to his collection. This booklet warns against the careless handling of unknown fish and against regarding all fish as suitable for food.

The author describes and depicts "harmful fish" under three categories: (1) Those whose flesh is poisonous, either inherently so from toxins in the tissues, or from bacterial contamination—a source common to all foods. Susceptibility on the part of the subject—allergy to certain fish as food—also receives mention. Some fish are poisonous as food at all times, as, for example, certain of the Tetraodontidiae; others are so at certain times or to certain persons, as Lethrinus and Epinephelus.

(2) Venomous fish which are actively or defensively venomous owing to erectile spines on the fins, with bags of poison at the bases; these bags are pressed upon when the spines are erected and poison is

injected into the wound which the spines themselves inflict. Several belong to the Synansejidae and Scorpaenidae. The flesh of these is not poisonous; they are edible.

(3) Predaceous or aggressive fish, dangerous because they attack man and may cause wounds fatal from shock and haemorrhage, such as sharks and Barracuda.

Little is said about symptoms set up by the poisoning and only a few general principles are mentioned regarding treatment—in short, little beyond first aid, as is proper in a book intended mainly for the non-medical reader. A few hints for collectors are also given in order that specimens may be properly preserved for sending to headquarters for identification. A more detailed and technical account is promised for early issue, and this will be awaited with much interest.

H. Harold Scott.

LILLIE, R. D. **Some Experiments on the Romanovsky Staining of Blood Films.** *J. Lab. & Clin. Med.* 1943, Dec., v. 28, No. 15, 1872–5.

Tests were made of several samples of Wright's and Giemsa's stains, using various dilutions and staining times. The blood films were fixed in methyl alcohol, and a phosphate buffer of *p*H 6·5 was used with the stains. The blood of white rats heavily infected with *Trypanosoma equiperdum* was used for the experiments and some tests of the stains were also made with films of patients infected with *Plasmodium vivax*. A Giemsa stain was prepared in the laboratory by a method of which details are given, and was found to be equal to, or better than, the commercial stains. The author formed the following conclusions from his experiments:—

1. Wright's staining solution (125 mgm. stain to 100 cc. methyl alcohol), when diluted with water to 1 : 4 and 1 : 9 and applied for 15 to 30 minutes, gives results equal to those obtained with Giemsa's stain.

2. Previous fixation in 80–100 per cent. methyl alcohol, and staining with pre-mixed dilutions of Wright's or Giemsa's stain, is the best method.

3. The addition of 7·5 per cent. of acetone to Giemsa's stain decreases the staining time to about half; using 1 : 10 Giemsa's stain with 7·5 per cent. acetone, thin blood films are stained in 5 minutes and thick films in 5–6 minutes.

J. F. Corson.

YATOM, J. **Remittent Rural Fever (Febris remittens agricolarum).** *Harefuah.* Jerusalem. 1944, Apr. 16, v. 26, No. 8. [In Hebrew 143–5, 1 chart. English summary 145–6.]

"The author records an outbreak of a specific fever among the pupils and staff of the Mikveh Israel Agricultural School which occurred early in 1940. He studied 254 cases which occurred in 212 pupils (out of a total of 379) 36 members of the staff (out of a total of 196). There were two peaks in the epidemic, one in January and another, after an interval of six weeks, in March. A small number of cases occurred between September 1939 and January 1940.

"SYMPTOMS.

"The disease commences with a complaint of headache and debility. The initial rise of temperature is light. On the 3rd day or so the temperature reaches its peak (up to 40°C.). The temperature is characteristically remittent; the temperature rises to maximum in the afternoon

and may be accompanied by a rigor followed by sweating and remits in the evening. In some cases where the temperature was taken frequently a secondary rise was found to occur during the late evening or at night. During the daily period of temperature the patient was depressed, had no appetite, and complained of headache usually supra-orbital, and muscular pains. The conjunctiva was congested and the face flushed. Immediately before and after the rise of temperature the patients feel remarkably well, have a good appetite and are cheerful. This feeling of well being during the apyrexial period is considered to be of importance for the differential diagnosis between rural remittent fever and infective hepatitis. The duration of illness (considered in days with pyrexia) is 4 to 12 days. In 90 per cent. of the cases the duration was 4 to 8 days ; in 4 per cent. up to 12 days ; in the remainder, including what were considered to be abortive cases, less than 4 days. In 5·4 per cent. of the cases the fever was continuous for 3 or 4 days and was subsequently remittent. The pulse is relatively slow in view of the temperature.

" The spleen was palpable in all cases even in the early stage of the disease and in a few cases reached to two finger breadths below the costal margin. The liver was enlarged and in some cases tender on palpation.

" *Blood changes* : A slight leucocytosis with a shift to the left in the early stages followed by a leucopenia and a relative increase in the number of large mononuclears (up to 10 per cent.).

" *Urine* : Traces of albumen were found. In the early stage urobilinogen was also found.

" *Complications* : ulcerative stomatitis was seen in 6 cases.

" In one case there was impairment of hearing during the disease followed by complete recovery.

" *Relapses* : Only one relapse was observed eight days after the initial remittent fever which lasted eleven days.

" EPIDEMIOLOGY.

" A study of the epidemiology brought out the following facts.

" (1) Contact infections could be excluded in the overwhelming majority of the cases. Infections via food and drinks can also be excluded.

" (2) 62 per cent. of the cases occurred in students who had fairly recently come from Europe.

" (3) Of the other cases the overwhelming proportion occurred in boys and in staff who came from towns in Palestine.

" (4) Very few cases occurred among children previously brought up in agricultural settlements or in workmen who had worked for long periods on farms. It is therefore concluded that this section of the local population was immune owing to previous attacks, in contrast to townsfolk who were not immune, probably because they had not previously been exposed.

" (5) No cases were observed among agricultural labourers originating from Turkey, Persia and Mesopotamia. It is considered that the disease occurs naturally in these countries.

" (6) There was no evidence of insect transmission. The nearest suburban districts containing non-immune recent arrivals were not affected.

" (7) It is considered that the reservoir of the disease is a rodent living in fields, probably a *microtus*. Field mice were a pest immediately

before and during the epidemic and their habits and distribution favour the view that when present in large numbers they contaminate fields and crops with the causative agent which invades susceptible human beings through the skin.

" (8) The above data and conclusions are supported by case histories and statistical tables."

IRVINE, C. **The Treatment of Ulcers by Plaster Casts.** *East African Med. J.* 1944, May, v. 21, No. 5, 143–6.

Several cases of bad ulcers of the leg or foot were admitted at about the same time to the Chogoría Hospital, Meru, Kenya Colony ; some were no doubt caused by yaws, others by malnutrition and some were probably due to a combination of causes. In spite of specific medical treatment, good feeding and a trial of a variety of local applications, the ulcers were slow to heal and required much attention. Plaster of paris was then tried ; six of the worst ulcers were encased in plaster of paris, with or without scraping. Pain became less within two days, the temperature fell within about five days, and a very noticeable mental change from despair to happiness was observed. There has been no failure in 30 cases in which the treatment has been used ; sloughs disappeared, healthy granulations were formed and the skin grew in from the edges. Notes of three cases are given. The plaster was kept on for periods of from two to four weeks ; in some cases it was applied over dressings with sulphonamide powder and " zipp." This treatment was also used with success in some other cases, including leprosy and burns. It was found that patients who would otherwise have required admission to hospital could be treated as out-patients.

J. F. Corson.

BLOXSOM, A. & CHANDLER, A. C. **Transient Paralysis due to Bite of American Dog Tick** (*Dermacentor variabilis* **Say).** *Amer. J. Dis. Children.* 1944, Feb., v. 67, No. 2, 126–7.

Paralysis due to *Dermacentor andersoni* is not uncommon, but hitherto only three cases due to *D. variabilis* have been reported ; the authors now record the fourth case. The patient was almost three years old, and the illness began with fever and restlessness ; the following day there was paralysis, and soon afterwards an engorged tick, later identified as *D. variabilis*, was found and removed from the scalp. The paralysis had disappeared in six hours from removal of the tick, but the following day the child was febrile, and the lymph glands of the neck were enlarged. Infection had apparently taken place, but this was soon dealt with and the patient's recovery was rapid and complete.

Charles Wilcocks.

BERGE, C. Etude bactériologique d'un bacille de Frisch isolé du premier cas de rhinosclérome publié en Tunisie. [**Bacteriology of the First-recorded Case of Rhinoscleroma in Tunisia.**] *Arch. Inst. Pasteur de Tunis.* 1942, Dec., v. 31, No. 3–4, 197–202.

Rhinoscleroma, common in Central Europe and Russia, is a rarity in France and the French Colonies. In May 1941, a native in Tunisia developed a throat lesion and puncture of it resulted in the discharge of

blood-stained serous fluid. A smear of this revealed Gram-negative coccobacilli and large encapsulated diplobacilli. On agar the former was isolated (it was also seen subepithelially in sections of the granuloma). It had the following characters: On agar, colonies creamy, mucoid, bacteria short, non-motile, Gram-negative; gelatin not liquefied, but nail-like growth with gas bubbles; neutral red glucose, gas production without discoloration; neutral red lactose, gas with yellow colouring later; peptone water, no indole after four days; litmus mild decolorized in 36 hours, no clotting; lead agar, no blackening. Acid and gas in glucose, galactose, laevulose, mannite, saccharose, lactose (little and late), glycerin and dulcite; acid, no gas, in maltose and inosite. Pathogenicity: Mice: Broth culture subcutaneously, 1 cc., killed in three days and the bacterium was found in the heart-blood. Guineapig, 2 cc. intraperitoneally, suffered from mild transient peritonitis and recovered.

Six months later, after twenty subculturings, the organism gave nearly the same biological reactions, but indole production was abundant in 24 hours growth in maltose yielded copious gas, but in glycerin none. Trial of its pathogenicity showed: Four mice injected with 1 cc. of a 24 hours' growth subcutaneously—one survived, one had an abscess, one died in three days and the other in five days. Guineapigs injected with 2 cc. intraperitoneally showed no reaction, local or general. Rabbits injected with 2 cc. intravenously died, one in two days, another in five days with wasting and diarrhoea; a dog which received 0·5 cc. beneath the nasal mucosa died emaciated in 2–3 weeks, but nothing abnormal was seen and no bacilli locally.

According to the American classification of the mucous bacteria, this organism, which was isolated by VON FRISCH in 1882, belongs to the *Klebsiella*, Type C. *H. Harold Scott.*

HOPP, W. B. **On the Epidemiology of Human Intestinal Parasite Infections in a State Hospital of Indiana.** *Amer. J. Hyg.* 1944, Mar., v. 39, No. 2, 138–44. [18 refs.]

A survey of inmates of the Evansville State Hospital for the Insane was carried out to determine the incidence of intestinal parasite infections. As at the time of admission all the 1,200 patients in the hospital were residents of Indiana, the results afford information concerning human intestinal parasite infections in the south-western part of the State. In all, 874 stools from 771 patients (457 males and 314 females) were examined. The following parasites and their incidence per cent. were discovered:—*E. histolytica*, 3·1; *E. coli*, 61·9; *E. nana*, 31·0; *I. bütschlii*, 3·8; *Giardia intestinalis*, 1·9; *C. mesnili*, 8·8; *E. vermicularis*, 7·4; *T. hominis*, 0·1; *T. trichiura*, 0·3; *S. stercoralis*, 3·2; *H. nana*, 0·1. Of the 771 patients examined, 582 (75·5 per cent.) were infected with one or more parasites. As regards *E. vermicularis*, 47 patients were examined by means of perianal scrapings, which yielded an incidence of 6·4 per cent. Cysts of protozoa and ova, larvae and even adults of helminths were recovered from the wards and bath rooms by sweeping and scraping out the cracks of the floor. A study of the movements in the hospital of patients harbouring *S. stercoralis* showed that at one time or another all had been inmates of a particular ward, from the bathroom of which rhabditiform and filariform larvae were isolated. It appeared possible that infections were contracted after admission,

as there was a tendency for the infection rates to increase after several years' stay in hospital. *C. M. Wenyon.*

See also p. 859, BAUMANN, **Eosinophiles in Pleural Effusion with Transient Eosinophilic Pulmonary Infiltration.**

DAVID, W. A. L. & BRACEY, P. **Activation of Pyrethrins in Fly-Sprays.** *Nature.* 1944, May 13, 594–5.

Activators are non-toxic substances which increase the effectiveness of pyrethrin sprays. In an attempt to explain the nature of their action the authors analyse the many factors involved in the killing of flying insects with a spray. All the experiments were done on *Aëdes aegypti* under controlled conditions in a spray chamber. They show that the insect picks up its dose of insecticide by impaction with droplets during flight: mosquitoes deprived of their wings or narcotized with chloroform are little affected by the spray mist; and such sedentary insects are killed when the mist is drawn past them at about 3 miles per hour, not when the same volume is drawn past at 0·3 miles per hour. There seems to be an optimum droplet size (of about 10μ) for securing maximum kill: if the droplet is too small, impaction with the insect does not take place; if it is too large the toxic principle is quickly lost from the air space by sedimentation. On the basis of these conclusions the authors find that one factor in the activation of pyrethrins is a simple physical one leading to the persistence of droplets in the air. All the activators are substances of low vapour pressure. Hence the droplets remain when the more volatile kerosene carrier has evaporated. Activation of this type is given by oleic acid, lubricating oil, sesame oil free from sesamin. But the authors make it clear that there are other factors in activation besides these physical ones. Thus activation is shown by pure sesamin without a heavy oil carrier.

V. B. Wigglesworth.

PARKIN, E. A. & GREEN, A. A. **Activation of Pyrethrins by Sesame Oil.** [Correspondence.] *Nature.* 1944, July 1, 16.

The authors have failed to demonstrate any activation of pyrethrins in sprays used against the house-fly by the incorporation of lubricating oil or of sesame oil free from sesamin. DAVID and BRACEY [above] have found that, as used against mosquitoes (*Aëdes aegypti*), sesame oil activates pyrethrin sprays not only by some specific property of the sesamin it contains but also by its being non-volatile and so ensuring the persistence of a mist of fine droplets. In tests on the house-fly only the former effect can be demonstrated. [It is not certain whether this difference is due to the different insect species used or whether it is due to the fact that in Parkin and Green's experiments very large dosages of spray were used and the flies were introduced into the test chamber *before* spraying—factors which would tend to eliminate the effect of persistence of the spray droplets.] *V. B. Wigglesworth.*

SNODGRASS, R. E. **The Feeding Apparatus of Biting and Disease-Carrying Flies: a Wartime Contribution to Medical Entomology.** *Smithsonian Misc. Collections.* Washington. 1943, July 19, v. 104, No. 1, 51 pp., 18 figs. [38 refs.]

In this paper is brought together in a concise form all that is at present known about the structure and the mechanism of action of the

mouth parts of the blood-sucking Diptera and of the house flies and their allies. The paper is very well and fully illustrated. Short notes are given on the habits and medical importance of each group of flies.
V. B. Wigglesworth.

LEVER, R. J. A. W. **Entomological Notes.** *Agric. J. Fiji.* Suva. 1943, v. 14, No. 3, 77–83. [22 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1944, May, v. 32, Pt. 5, 102.]

There was a fairly heavy outbreak of dengue in Suva in May and June 1943. The disease occurred in Fiji in 1885 and again in 1908, when it was apparently introduced from Queensland; records of its distribution in other islands in the Pacific are cited from a recent publication, and notes are given on the breeding places of *Aëdes aegypti*, L., the vector. An experiment in the New Hebrides showed that *Anopheles punctulatus*, Dön., could develop in samples of water from Suva. Larvae of *Aëdes scutellaris pseudoscutellaris*, Theo., and *Culex fatigans*, Wied., from Suva were reared to the adult stage in water from two rivers on the northern coast of Guadalcanal having pH values of 7·31 and 5·57, respectively, and 1·1 and 0·8 parts chlorides per 100,000, but all died in the water of a third river that had a pH of 7·07 and 1,880·0 parts chlorides per 100,000. Nitrates were not a factor. Notes are given on the breeding places of a number of other Culicine larvae. Normal adults of *C. annulirostris*, Skuse, were reared from young larvae placed in brackish water that would have repelled ovipositing females of this species in nature. A dust containing 1 per cent. Paris green failed to control *C. fatigans* in a slowly flowing stream, and one containing 2 per cent. did not give a complete kill.

ROUBAUD, E. & GRENIER, P. Simulies de l'Ouest Africain (Afrique équatoriale et occidentale françaises). [**Simuliidae of West Africa.**] *Bull. Soc. Path. Exot.* 1943, Oct. 13, v. 36, No. 9–10, 281–311, 11 figs. & 10 pls. [23 refs.]

Four new species (*S. monoceros*, *loangolense*, *djallonense*, and *altipartitum*) are described and notes on ten previously described species are given as the result of the study of a collection of material from Moyen-Congo (collected by French Sleeping Sickness Commission, 1906-1908), from Dahomey (collected by Bouet & Roubaud, 1909–1912) and some other sources. The authors stress the importance of the external genitalia in the discrimination of the species of Simuliidae and they describe and figure the male and female external genitalia of *S. damnosum* Theob. in some detail as a standard for comparing the others with. There are no keys for the determination of species either as adults or as pupae.

Previously, apart from scattered notes, two papers by POMEROY (*Ann. Mag. Nat. Hist.*, 1920, v. (9) 6, 72–80) and *Bull. Ent. Res.*, 1922, v. 12, 457–463) and DE MEILLON's summary of the African species (*Bull. Ent. Res.*, 1930, v. 21, 185–200) contained all that was known of West African Simuliidae. The present paper is a valuable contribution to the knowledge of the Simuliid fauna of the region. *John Smart.*

VAN SOMEREN, G. R. C. **Some Records of Simuliidae in Abyssinia and British Somaliland.** *Bull. Entom. Res.* 1944, July, v. 35, Pt. 2, 113–14.

COOLEY, R. A. & KOHLS, G. M. **The Genus *Amblyomma* (Ixodidae) in the United States.** *J. Parasitology.* 1944, Apr., v. 30, No. 2, 77–111, 12 figs. [61 refs.]

ELLIS, F. A. **Reno-Ureteral Colic with Hematuria at an Advance Base Hospital.** *U.S. Nav. Med. Bull.* 1944, May, v. 42, No. 5, 1033–4.

At this hospital many patients were admitted with the diagnosis of renal colic, ureteral colic and haematuria; examination showed 27 cases of renal calculus, 19 of ureteral calculus and 1 of vesical calculus, the remaining cases being "common urologic conditions with essentially negative findings." All the patients came from areas with a typical tropical climate and most of them had not been drinking sufficient water to balance the loss by perspiration; their urine became highly concentrated and heavy crystallization occurred. Their diet had contained much protein and was deficient in green vegetables, while fresh milk and butter were unobtainable. The author thinks it possible that "showers of uric acid crystals passing down the ureter created an irritating influence and caused the renal colic and haematuria in many cases." Sulphonamide drugs, as a cause of the condition, could be excluded. Recovery was rapid after the proper water balance had been adjusted. [See also this *Bulletin*, 1944, v. 41, 154.]

J. F. Corson.

HENSCHEL, A., TAYLOR, H. L. & KEYS, A. **The Persistence of Heat Acclimatization in Man.** *Amer. J. Physiol.*, 1943, Dec. 1, v. 140, No. 3, 321–5.

The major adjustments in heat acclimatization occur during the first few days in the heat. Acclimatization is lost in a cool environment, but in the literature there is little to indicate how quickly this loss takes place. The work described in this paper was undertaken with the object of ascertaining how long acclimatization persists. Experiments were carried out on 24 fit male college students aged 19 to 28 years. All were made to work in a hot environment for a preliminary period, and then after an interval they repeated the experiments. The investigation was made in the winter months, and during the intervals between the experimental periods the subjects were not exposed to heat. For some subjects the interval was one week, and for others two, three or four weeks. Diet, work, rest and observations were standardized.

In each experiment work was done on two successive afternoons at 78°F., followed by two full days of work at 110°F. in the mornings and 120°F. in the afternoons. Night temperatures were between 85° and 90°F., and the relative humidity was kept constant at 20 to 25 per cent. Subjects remained continuously in the air-conditioned apartments from the afternoon preceding each exposure to high temperatures until the end of each experiment. The physical work consisted of walking on a treadmill at 3·25 miles per hour with a 7·5 per cent. angle of climb; it demanded an oxygen consumption of about seven times the basal rate. Each half day's work consisted of six 10-minute work periods alternating with 10-minute rest periods. Standard clothing of cotton shorts, shoes and socks was used for work, while one-piece U.S. Army Armoured Force battle dress (cotton drill) was used in the evenings.

Pulse rates before and during the first 15 seconds after each work period were counted. Rectal temperatures were taken after the third and sixth work periods. By weighing, sweating rates were determined

for the third work period in the morning and the sixth in the afternoon. The diet contained 3,100 calories and was normally balanced. It was adequate in vitamins, and provided about 15 gm. of sodium chloride per day. Water was allowed as desired.

Comparisons were made between the performances in the heat in the first and second periods of exposure. When the interval between the exposures was one or two weeks only, the working pulse rates were significantly lower on the second exposure for both the first and second afternoons in the heat. In those subjects whose second exposure followed three weeks after the first the improvement in pulse rate was only noticeable in the second afternoon; and in those who had an interval of four weeks between exposures there was no significant improvement. Similar effects were exhibited by the rectal temperatures. The improvement after a two or three weeks' interval was smaller than after only one week, while no effect was apparent when the interval was four weeks.

Thus it appears that when persons are partially acclimatized to heat in the manner described, some part of that acclimatization persists during three weeks of cold weather, but the benefit decreases from week to week. It is suggested that a longer initial period of acclimatization might result in longer persistence of that acclimatization, but there is no evidence on this point. *T. Bedford.*

TAYLOR, H. L., HENSCHEL, A., MICKELSEN, O. & KEYS, A. **The Effect of the Sodium Chloride Intake on the Work Performance of Man during Exposure to Dry Heat and Experimental Heat Exhaustion.** *Amer. J. Physiol.* 1943, Dec. 1, v. 140, No. 3, 439–51. [22 refs.]

Much work has been done on the part played by sodium chloride in the causation and treatment of heat cramps. This paper is concerned with its relationship to heat exhaustion and cardiovascular function in men working in the heat.

Forty-nine normal young men were the subjects, who lived and worked under controlled conditions on three different levels of salt intake. The control conditions were a dry bulb temperature of 80°F. and a wet bulb of 65°F. Hot conditions by day were 120°F. dry bulb and 85°F. wet bulb, while the night (6 p.m. to 8 a.m.) conditions during the hot period were 85° to 95° dry bulb and 65° to 75° wet bulb. Work, consisting of walking on a treadmill at 3·25 miles per hour with 7·5 per cent. gradient, was done for six 10-minute periods alternating with 10-minute rest periods in each half day. Working pulse rates were obtained by counting the pulse in the quarter minute immediately after each work period; rectal temperatures were taken twice each half day, after the third and sixth work periods; sweating was measured during the third morning work period and the last afternoon period. Sodium chloride intakes were 6 gm. per day (low), 15 gm. (moderate), and 30 gm. (high). Water was allowed as desired. Periods in the heat ranged from two to eight days.

Sweating amounted to from 5 to 8 litres per day. No advantage in any of the variables measured was demonstrated for men on a high salt intake as compared with those on a moderate intake.

In the heat, the working pulse rates were significantly higher in those on a low salt intake than in those who had the moderate intake. On the whole, the difference was about 15 to 20 beats per minute.

Rectal temperatures, too, were generally about 0·5°F. higher in the low intake group.

During the first day in the heat, the " low " and " moderate " intake groups sweated at about the same rate. The low intake group failed to drink enough water, and ended the first day with a dehydration loss of 2·5 per cent. of the body weight, compared with only 0·77 per cent. for the moderate chloride group. The sodium chloride balance in the " low " group represented a loss of 8·39 gm., while in the " moderate " group it was only 0·53 gm. On the second and third days the sweat loss in the " moderate " group scarcely changed, whereas it declined in the " low " intake group.

The low salt intake resulted in an average deficit of 13 gm. of sodium chloride for three days in the heat, whereas after that time those who had had the moderate intake appeared to be in sodium chloride balance.

Heat exhaustion and prostration occurred in 25 per cent. of the men on low salt intake, and in only 2·5 per cent. of those on the moderate intake.

Although pronounced hypochloraemia was observed in many instances, heat cramps did not occur. The hypochloraemia was of similar degree to that reported in cases of heat cramp ; and it is concluded that sodium chloride loss *per se* and the resulting reduction in plasma chlorides may not necessarily lead to heat cramps, but, in many cases, to heat exhaustion instead.

It has been reported that there is a linear relationship between rectal temperature and the concentration of chloride in the sweat. The present experiments gave little or no support to this thesis.

It appears that a moderate salt intake is important in preserving cardiovascular function in the heat. The sodium chloride requirement of unacclimatized men who are sweating 5 to 8 litres per day is not greater than 13 to 17 gm. daily. Increase of salt intake above this level results in increased loss of salt and water in the urine, with no apparent advantage. *T. Bedford.*

MINISTRY OF HEALTH. DEPT. OF HEALTH FOR SCOTLAND. **Report of Inter-Departmental Committee on Medical Schools** [GOODENOUGH, W., Chairman]. 313 pp. 1944. London : H.M. Stationery Office. [4*s.* 6*d.*]

BOOK REVIEWS.

EVANS, H. Muir. **Sting-Fish and Seafarer.** 180 pp., 31 figs. & 8 pls. 1944. London : Faber & Faber Ltd., 24 Russell Square. [15*s.*]

This is an interesting book and one feels while reading it that it has been written with enthusiasm and enjoyment by an author, who has fitted his hobby into his daily work to the advantage of both. The book is in the earlier sections in part biographical, in part of the nature of a " travelogue " written in a chatty manner, interspersed with anecdotes and reminiscences, and with digressions into etymology and place-names, pollen analysis and peat-formation, among other things.

The author was, as a boy, interested in home-water fish ; later, after becoming medically qualified, he went abroad as ship's surgeon and his interest grew to include fish in tropical waters. Next, for twenty years

or more he was in practice in Lowestoft and got to know the fishermen well and the nature of the accidents and injuries incidental to their calling, and for forty years has been surgeon to the local hospital. He has studied fish, first as a naturalist and then as a doctor paying attention to the wounds they inflict by bite or by inoculated poison. He describes and deals in turn with weevers, dragon-fish (Trachinidae) and other stinging fish, the sting-ray, spiny dogfish, black and white scabbard fish, Scorpaenidae and Synanceia, Muraena, catfish, venomous fish of Malayan waters, electric fish and Rhizostoma (so-called jellyfish). He writes also of the stinging corals, mentioned by Darwin, and of sponge-divers' disease [known also as Zervos's disease from its first describer, Skévos Zervos] due to a sea-anemone living in commensal association with sponges [see *Bulletin of Hygiene*, 1938, v. 13, 354–5]. Space forbids our going in much detail into the many interesting points in this work, which is full of suggestions for further study. The author notes how strange it is that though the bite of Muraena is toxic, nothing is known as yet of the toxin or even its source or place of production; the same applies to the Black Scabbard, whose bite and dagger are poisonous, though it does not appear to possess any definite poison-gland. There are useful concluding chapters with hints on the preservation of specimens for study, some general directions regarding treatment, on the fish's weapons of defence, those of the nature of camouflage and those of offence.

Though dealing largely with fish found in British waters, the work has considerable reference and application to similar or analogous forms encountered elsewhere; the author quotes abundantly from the literature on the many subjects upon which he touches. He also makes interesting strayings into superstitions and folk-lore and gives accounts of migrations of fish, mentioning the White Scabbard which, on occasion, swims to and dies on the shores of New Zealand in large numbers, and draws comparison between this and the migration of lemmings, and of springbok from the Orange River Colony to the sea. There is a fascinating narrative of the life-cycle and Odyssey of the European eel.

The work is not beyond the grasp of the intelligent layman and, as already remarked, is written in an engaging style and is, therefore, eminently suitable for the general reader and would also serve usefully as a reliable introductory guide to a practitioner, living near the sea, who would like to take up the study. More than this, it is a strong incentive showing how a man in general practice can, if he wishes, take up a branch of science as a hobby and, by making good use of his opportunities, can accomplish useful and interesting work of a research character, with little and inexpensive equipment. With the foregoing reservation, it is probable that the non-medical man would find it more appealing than the medical, for the scientific parts are often too elementary for the qualified practitioner, who hardly needs to be told, for example, that a poison-gland is not the same thing as lumps in the neck of children when their tonsils are inflamed, or those in the armpit from a sore hand. The author naively calls attention to the curious mentality of certain British people who raise no objection to skinning soles or boiling lobsters alive but who pass a stringent law by which a scientist is not permitted to inoculate a fish or an animal for the purpose of investigating a venom whose properties it may be important to humanity to elucidate, without a licence from the Home Office

insisting that the experiment must be conducted in an approved institution. Consequently, and presumably owing to such restrictions, the author says little regarding the nature and composition of the different poisons or of the physiological effects of the several constituents of mixed poisons (as has been done for snake venoms, which some fish poisons are said to resemble in their effects) beyond the fact that some are haemolytic in action, while others are neurotoxic or cause shock, syncope and collapse.

The descriptions of the fish are good and the line drawings are excellent; these would have been even more instructive if some at least had been reproduced in colour. A number of plates demonstrate well the histological structure of the poison apparatus and the poison glands. A fuller index would have enhanced the value of the book. A work such as this calls for a particularly full and accurate index. The reviewer, wishing to look up Scabbard Fish, found in the Index merely " see also Black Scabbard," but this has no mention at all in the Index. The illustrations are very good, but the lettering may have no accompanying explanation in the legend or the text, as in Fig. 24, p. 105, and the majority make no mention of the scale or magnification of the drawing. Not one of the eight plates demonstrating the histology has any better indication than " low power " or " high power." Nonetheless, to conclude, the book is highly interesting and should make a wide appeal: To the intelligent layman, on account of the information, general and special, which it imparts; to the medical man also who wishes for an introduction into a fascinating subject, and to the comparative anatomist. It contains a good deal of science and no little amount of speculation and is consequently a strong incentive to further scientific study. *H. Harold Scott.*

REED, Alfred C. [M.D., Associate Clinical Professor of Medicine, Stanford University School of Medicine] & GEIGER, J. C. [M.D., Director of Public Health, San Francisco, California]. **Handbook of Tropical Medicine.** pp. ix+188. 1944. Stanford University Press, California & London: Humphrey Milford, Oxford University Press. [9*s*. 6*d*.]

This book is intended to be a practical clinical guide for American doctors many of whom, owing to the war, will meet with tropical diseases, both abroad and at home, of which they have little knowledge or experience. It is a book of 182 pages, is of pocket size, and is printed in relatively large type. Brief accounts are given of nearly all the diseases that are usually included in text-books of tropical diseases; leprosy, undulant fever, enteric fevers, a few virus diseases, snake-bite and some other forms of poisoning are omitted. There are no illustrations and very few notes on laboratory methods of diagnosis. Cerebral malaria is not mentioned nor is there any reference to the treatment of malaria by intramuscular or intravenous injections. Sleeping sickness in Tanganyika Territory is stated to be caused by *Trypanosoma gambiense* although the Rhodesian form has been predominant there for over 20 years. In the reviewer's opinion this handbook cannot replace a good text-book of tropical diseases, which is indispensable in the circumstances for which the use of the handbook is intended; it would, however, be useful for a preliminary survey of the subject or for rapid revision. It is difficult to imagine conditions in which a good text-book would be too large to be carried. *J. F. Corson.*

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